L ENTRY LEXICON USER'S PAGE NO. 1 E0 S3

	VARIABLE	DESCRIPTION	MAXIMUM VALUE *	COMPUTER NAME
R0001				
R0003				
R0005	-			
R0006	URT0	INITIAL TARGET VECTOR	2 (UNIT VECTOR)	= RTINIT
R0008	-			
R0009	UZ	UNIT VECTOR NORTH	1	= UNITW
R0011	-			
R0012	V	VELOCITY VECTOR	2 VSAT	= VEL
R0014	-			
R0015	R	POSITION VECTOR	2 EXP 29 METERS	= RN
R0017	-			
R0018	VI	INERTIAL VELOCITY	128 M/CENTISEC	= VN
R0020	-			
R0021	RTE	VECTOR EAST AT INITIAL TARGET	2	= RTEAST
R0023	-			
R0024	UTR	NORMAL TO RTE AND UZ	2	= RTNORM
R0026	-			
R0027	URT	TARGET VECTOR	2	= RT
R0029	-			
R0030	UNI	UNIT NORMAL TO TRAJECTORY PLANE	2	
R0031	-			
R0032	DELV	INTEGRATED ACCEL. FROM PIPAS	5.65 16384 CM/S	
R0033	-			
R0034	G	GRAVITY VECTOR	128 M/CENTISEC	= GDT/2
R0036	A_0	INITIAL DRAG FOR UPCONTRL	605 FPSS	FPSS=FT/SEC/SEC
R0038	AHOOKDV	TERM IN GAMMAL CALC. = AHOOK DVL	16	
R0039	A_1	DRAG VALUE IN FACTOR CALCULATION	605 FPSS	
R0040	ALP	CONST FOR UPCONTRL	1	
R0041	ASKEP	KEPLER RANGE	21600 NM	NM = NAUTICAL MILE
R0043	ASP_1	FINAL PHASE RANGE	21600 NM	
R0044	ASPUP	UP-RANGE	21600 NM	
R0045	ASP3	GAMMA CORRECTION	21600 NM	
R0046	ASPDWN	RANGE DOWN TO PULL-UP	21600 NM	
R0047	ASP	PREDICTED RANGE	21600 NM	NOT STORED
R0049	COSG	COSINE(GAMMAL)	2	= COSG/2
R0051	C/D_0	RECIPROCAL DRAG, $-4/D_0$ B-8	84/FPSS	
R0052	D	TOTAL ACCELERATION	805 FPSS	
R0053	D_0	CONTROLLED CONSTANT D	805 FPSS	
R0054	DHOOK	TERM IN GAMMAL COMPUTATION	605 FPSS	
R0055	DIFF	THETNM-ASP (RANGE DIFFERENCE)	21600 NM	
R0058	DIFFOLD	PREVIOUS VALUE OF DIFF	21600 NM	
R0057	DLEWD	CHANGE IN LEWD	1	
R0056	DR	REFERENCE DRAG FOR DOWNCONTROL	805 FPSS	NOT STORED
R0060	DREFR	REFERENCE DRAG	805 FPSS	NOT STORED
R0062	DVL	VS_1-VL	2 VSAT	
R0063	E	ECCENTRICITY	4	NOT STORED
R0065	F_1	DRANGE/D DRAG (FINAL PHASE)	2700/805	= FX +5
R0067	F_2	DRANGE/D RDOT (FINAL PHASE)	2700/2VS NM/FPS	= FX +4

L ENTRY LEXICON USER'S PAGE NO. 2 E0 S3

R0069	P_3	DRANGE/D (L/D)	2700 NM	= PX
R0071	$FACT_1$	CONST FOR UPCONTRL	805 FPSS	
R0072	$FACT_2$	CONST FOR UPCONTRL	1/805 FPSS	
R0073	FACTOR	USED IN UPCONTRL	1	* MAXIMUM VALUE DENOTES UNSCALED
R0075	GAMMAL	FLIGHT PATH ANGLE AT VL	1 RADIAN	VARIABLE VALUE WHEN SCALED
R0077	$GAMMAL_1$	SIMPLE FORM OF GAMMAL	1 RADIAN	VARIABLE HAS MAXIMUM VALUE OF ONE.

P0079 R0081	VARIABLE	DESCRIPTION	MAXIMUM VALUE	COMPUTER NAME
R0083	HEADSUP	INDICATOR FOR INITIAL ROLL	1	
R0084	KA	DRAG TO LIFT UP IF DOWN	805 FPSS	= KAT
R0086	KLAT	LATERAL SWITCH GAIN	1	(NOM = .0125)
R0088	K2ROLL	INDICATOR FOR ROLL SWITCH		
R0089	LAD	MAX L/D (MIN ACTUAL VEHICLE L/D)	1	
R0090	LADPAD	NOMINAL VEHICLE L/D, SP PAD LOAD	1	(NOM = 0.3)
R0092	LATANG	LATERAL RANGE	4 RADIANS	
R0093	LEQ	EXCESS C.F. OVER GRAV=(VSQ-1)GS	128.8 FPSS	
R0094	LEWD	UPCONTROL REFERENCE L/D	1	
R0095	LOD	FINAL PHASE L/D	1	(NOM = 0.18)
R0097	LODPAD	FINAL PHASE L/D, SP PAD LOAD	1	
R0098	L/D	DESIRED LIFT TO DRAG RATIO	1	
R0099		(VERTICAL PLANE)		
R0100	L/D_1	TEMP STORAGE FOR L/D IN LATERAL	1	
R0101	L/DCMINR	LAD COS(15DEG)	1	(NOM = 0.2895)
R0103	PREDANGL	PREDICTED RANGE (FINAL PHASE)	2700 NM	= PREDANG
R0105	Q2	FINAL PHASE RANGE -23500 Q3	21600 NM	
R0106		Q2 = PCN(LAD)		
R0107	Q7	MINIMUM DRAG FOR UPCONTROL	805 FPSS	
R0108	RDOT	ALTITUDE RATE	2 VSAT	
R0109	RDOTREF	REFERENCE RDOT FOR UPCONTROL	2 VSAT	
R0110	RDTR	REFERENCE RDOT FOR DOWNCONT	2 VSAT	NOT SAVED
R0112	ROLLC	ROLL COMMAND	1 REVOLUTION	
R0113	RTOGO	RANGE TO GO (FINAL PHASE)	2700 NM	= PX +2
R0115	SL	SINE OF LATITUDE	1	NOT SAVED
R0117	T	TIME	B 28 CENTISEC	= $TIME_2$,$TIME_1$
R0119	THETA	DESIRED RANGE (RADIANS)	2 PI RADIANS	= THETAH
R0121	THETNM	DESIRED RANGE (NM)	21600 NM	NON EXISTENT
R0123	V	VELOCITY MAGNITUDE	2 VSAT	
R0124	V_1	INITIAL VELOCITY FOR UPCONTROL	2 VSAT	
R0125	VL	EXIT VELOCITY FOR UPCONTROL	2 VSAT	
R0126	VREF	REFERENCE VELOCITY FOR UPCONTROL	2 VSAT	
R0127	VS_1	VSAT OR V_1, WHICHEVER IS SMALLER	2 VSAT	
R0128		$2 \quad 2$		
R0129	VBARS	$VL^2/VSAT^2$	4	
R0130		$2 \quad 2$		
R0131	VSQ	NORMALISED VEL. SQUARED = $V^2/VSAT^2$	4	= VSQUARE
R0133	WT	EARTH RATE TIMES TIME	1 REVOLUTION.	NOT SAVED
R0135				= WIE (DTEAROT)
R0137	X	INTERMEDIATE VARIABLE IN G-LIMITER	2 VSAT	NOT SAVED
R0139	Y	LATERAL MISS LIMIT	4 RADIANS	NOT SAVED

R0141 EXTRA COMPUTER ERASABLE LOCATIONS NOT SHOWN ON FLOW CHARTS
R0142 ---

	VARIABLE	DESCRIPTION	MAXIMUM VALUE
R0143			
R0144			
R0145	GOTOADDR	ADDRESS SELECTED BY SEQUENCER	
R0146	XPIPBUF	BUFFER TO STORE X PIPA COUNTS	
R0147	YPIPBUF	BUFFER TO STORE Y PIPA COUNTS	
R0148	ZPIPBUF	BUFFER TO STORE Z PIPA COUNTS	
R0149	PIPCTR	COUNTS PASSES THRU PIPA READ ROUTINE	
R0150	JJ	INDEX IN FINAL PHASE TABLE LOOK-UP	
R0151	MM	INDEX IN FINAL PHASE TABLE LOOK-UP	
R0152	GRAD	INTERPOLATION FACTOR IN FINAL PHASE	
R0153	FX	DRANGE/D L/D = P_3	2700 NM
R0154	FX + 1	AREF	805 FPSS
R0155	FX + 2	RTOGO	2700 NM
R0156	FX + 3	RDOTREF	VSAT/4
R0157	FX + 4	DRANGE/D RDOT = P_2	21800/2VS NM/FPS
R0158	FX + 5	DRANGE/D DRAG = P_1	2700/805 NM/FPSS
R0159	TEM1B	TEMPORARY LOCATION	
R0160	TIME/RTO	TIME OF INITIAL TARGET RTINIT	B 28 CENTISEC
R0161	DTEAROT	EST TIME BETWEEN RTINIT AND RT	B 28 CENTISEC
R0162	-		
R0163	UNITV	UNIT V VECTOR	2
R0164	-		
R0165	UNITR	UNIT R VECTOR	2
R0166	-		
R0167	-VREL	NEGATIVE VELOCITY REL TO ATMOSP	2 VSAT

	COMPUTER SWITCHES		INITIAL STATE	CM/FLAGS = STATE +6
R0168				
R0170				
R0172	ENTRYDSP	DO ENTRY DISPLAY, IP SET	NON-BRANCH (1)	92D, BIT13
R0174	GONEPAST	INDICATES OVERSHOOT OF TARGET	NON-BRANCH (0)	95D, BIT10
R0176	RELVELSW	RELATIVE VELOCITY SWITCH	NON-BRANCH (0)	98D, BIT 9
R0178	EGSW	FINAL PHASE SWITCH	NON-BRANCH (0)	97D, BIT 8
R0180	FIRSTPAS	INITIAL PASS THRU HUNTEST	NON-BRANCH (0)	98D, BIT 7
R0182	HIND	INDICATES ITERATION IN HUNTEST	NON-BRANCH (0)	99D, BIT 6
R0184	INRLSW	INDICATES INIT ROLL ATTITUDE SET	NON-BRANCH (0)	100D, BIT 5
R0186	LATSW	INHIBIT DOWNLIFT SWITCH IF NOT SET	BRANCH (1)	101D, BIT 4
R0188	.05GSW	INDICATES DRAG EXCEEDS .05 GS	BRANCH (0)	102D, BIT 3
R0190	GONEBY	INDICATES GONE PAST TARGET (SET)	SELF-INITIALZNG	112D, BIT 8

P0192	CONSTANTS AND GAINS		VALUE	
R0194	----------		-----	
R0196	C_1	FACTOR IN ALP COMPUTATION	1.25	
R0196	C_{16}	CONSTD GAIN ON DRAG	.01	
R0200	C_{17}	CONSTD GAIN ON RDOT	.001	
R0202	C_{18}	BIAS VEL. FOR FINAL PHASE START	500	FPS
R0204	C_{20}	MAX DRAG FOR DOWN-LIFT	175	FPSS
R0206	CHOOK	FACTOR IN AHOOK COMPUTATION	.25	
R0206	CH_1	FACTOR IN GAMMAL COMPUTATION	1.0	
R0210	COS15	COS(15 DEG)	.965	
R0212	$DLEWD_0$	INITIAL VARIATION IN LEWD	-.05	
R0214	D_2	DRAG TO CHANGE LEWD	175	FPSS
R0216	DT	COMPUTATION CYCLE TIME INTERVAL	2	SEC.
R0216	GMAX	MAXIMUM ACCELERATION	257.6	FPSS (8 G-S)
R0220	KA_1	FACTOR IN KA CALC	1.3 GS	
R0222	KA_2	FACTOR IN KA CALC	.2 GS	
R0224	KA_3	FACTOR IN D_0 CALC	90 FPSS	
R0226	KA_4	FACTOR IN D_0 CALC	40 FPSS	
R0228	KB_1	OPTIMIZED UPCONTROL GAIN	3.4	
R0230	KB_2	OPTIMIZED UPCONTROL GAIN	.0034	
R0232	KDMIN	INCREMENT ON Q_7 TO DETECT END OF KEPLER PHASE	.5	FPSS
R0234	KTETA	TIME OF FLIGHT CONSTANT	1000	
R0236	$KLAT_1$	FACTOR IN KLAT CALC	1/24	
R0238	K44	GAIN USED IN INITIAL ROLL SECTION	19749550	FPS
R0240	LATBIAS	LATERAL SWITCH BIAS TERM	.41252961	NM
R0242	$LEWD_1$	NOMINAL UPCONTROL L/D	.15	
R0244	POINT1	FACTOR TO REDUCE UPCONTROL GAIN	.1	
R0246	Q_2	FINAL PHASE RANGE - 23500 Q_3	-1002	NM
R0248	Q_3	FINAL PHASE DRANGE/D V	.07	NM/FPS
R0250	Q_5	FINAL PHASE DRANGE/ D GAMMA	7050	NM/RAD
R0252	Q_6	FINAL PHASE INITIAL FLIGHT PATH ANGLE	.0349	RAD
R0254	Q_{7F}	MIN DRAG FOR UPCONTROL	6	FPSS
R0256	Q_{7MIN}	MIN VALUE FOR Q_7 IN FACTOR CALCULATION	40	FPSS
R0258	Q_{19}	FACTOR IN $GAMMAL_1$ CALCULATION	.5	
R0260	Q_{21}	FACTOR IN Q_2 CALCULATION.	1000	NM
R0262	Q_{22}	FACTOR IN Q_2 CALCULATION.	-1302	NM
R0264	$VFINAL_1$	VELOCITY TO START FINAL PHASE ON INITIAL ENTRY	27000	FPS
R0266	VFINAL	FACTOR IN INITIAL UP-DOWN CALC	26600	FPS
R0268	VLMIN	MINIMUM VL	16000	FPS
R0270	VMIN	VELOCITY TO SWITCH TO RELATIVE VEL	VSAT/2	
R0272	VRCONTRL	RDOT TO START INTO HUNTEST	700	FPS
R0274		VRCONT = COMPUTER NAME		
R0275	25NM	TOLERANCE TO STOP RANGE ITERATION	25	NM
R0277	VQUIT	VELOCITY TO STOP STEERING	1000	FPS

P0279 CONVERSION FACTORS AND SCALING CONSTANTS
R0280 ---------- ------- --- ------- ---------

R0281	ATK	ANGLE IN RAD TO NM	3437.7468	NM/RAD
R0283	GS	NOMINAL G VALUE FOR SCALING	32.2	FPSS
R0285	RS	ATMOSPHERE SCALE HEIGHT	28500	FT
R0287	J	GRAVITY HARMONIC COEFFICIENT	.00162348	
R0289	KRE	EQUATORIAL EARTH RATE	1546.70188	FPS
R0291	MUE	EARTH GRAVITATIONAL CONSTANT	3.988032233 E 14	CUBIC M/ SEC SEC
R0293	RE	EARTH RADIUS	21202900	FT
R0295	REO	EARTH EQUATORIAL RADIUS	20925738.2	FT
R0297	VSAT	SATELLITE VELOCITY AT RE	25788.1973	FPS
R0299	WIE	EARTH RATE	.0000729211505	RAD/SEC

A0301
R0302 DISPLAY QUANTITIES (END GSOP AS-278, VOL 1, FIG. 5.6-3 CONSTANTS,GAINS, ETC.)
R0303 ----------

R0304 (SEE SECTION 4 OF THE GSOP FOR SIGN CONVENTIONS.)

	VARIABLE	DESCRIPTION	MAXIMUM VALUE	
R0305 R0308			------- -----	
R0307	GMAX	PREDICTED MAXIMUM ENTRY ACCEL	183.84 GS	N 60
R0309	VPRED	PREDICTED VELOCITY AT ALTITUDE	128 M/CENTISEC	N 60
R0311		400K FT ABOVE FISCHER RADIUS.		
R0312	GAMMAEI	PREDICTED GAMMA AT ALTITUDE	1 REVOLUTION	N 60
R0314		400K FT ABOVE FISCHER RADIUS.		
R0315	D	DRAG ACCELERATION	805 FPSS	N 64
R0317	VMAGI	INERTIAL VELOCITY MAGNITUDE	128 M/CENTISEC	N 64, N 88
R0319	THETAH	DESIRED RANGE ANGLE NM	1 REVOLUTION	N 64, N 87
R0321	LAT	PRESENT LATITUDE	1 REVOLUTION	N 67
R0323	LONG	PRESENT LONGITUDE	1 REVOLUTION	N 67
R0325	RTOGO	RANGE ANGLE TO SPLASH FROM	1 REVOLUTION	N 63
R0327		EMSALT FT ABOVE FISCHER RADIUS. (IN NM)		
R0328	VIO	PREDICTED VELOCITY AT ALTITUDE	128 M/CENTISEC	N 63
R0330		EMSALT FT ABOVE FISCHER RADIUS.		
R0331	TTE	TIME OF FREE FALL TO ALT	B 28 CENTISEC	N 63
R0333		EMSALT FT ABOVE FISCHER RADIUS.		
R0334	ROLLC	ROLL COMMAND	1 REVOLUTION	N 68, N 88, N 89
R0338	LATANG	CROSS-RANGE ERROR (XRNGERR)	4 RADIANS	N 66
R0338	DNRNGERR	DOWN RANGE ERROR	1 REVOLUTION	N 66
R0340		(PREDANG - THETAH · IN NM)		
R0341	HDOT	ALTITUDE RATE	128 M/CENTISEC	N 68
R0343	QT	MINIMUM DRAG FOR UPCONTROL	805 FPSS	N 69
R0345	VL	EXIT VELOCITY FOR UP-CONTROL	2 VSAT	N 69

P0347 BODY ATTITUDE QUANTITIES (CM/POSE)
R0348 ----------

R0349	VARIABLE	DESCRIPTION	MAXIMUM VALUE
R0350	--------	-----------	------- -----
R0351	-		
R0352	-VREL	NEGATIVE VELOCITY REL TO ATMOS.	2 VSAT
R0353	-		
R0354	OLDUYA	USED FOR UYA BELOW 1000 FPS	2
R0355	-		
R0356	UXA/2	UNIT VECTOR TRIAD	2
R0357	-		
R0358	UYA/2	BASED ON	2
R0359	-		
R0360	UZA/2	THE TRAJECTORY.	2
R0361	-		
R0362	UBX/2	UNIT VECTOR	2
R0363	-		
R0364	UBY/2	BODY TRIAD	2
R0365	-		
R0366	UBZ/2	FOR CM.	2

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R0001 ENTRY INITIALIZATION ROUTINE
R0002 ----------

```
0003                        25,2000                 BANK    25
0004  REF   1              25,2000                 SETLOC  REENTRY
0005                        25,2000                 BANK

0006  REF   1                                       COUNT*  $$/ENTRY
0007  REF   7  LAST  750   E7,1451                  EBANK=  RTINIT

0008  REF   6  LAST  661     4753          EBENTRY =       EBANK7
0009  REF  11  LAST  661     4752          EBACQ   EQUALS  EBANK6
0010  REF   8  LAST  779     4675          NTRYPRIO EQUALS PRIO20          (SERVICER)
0011  REF  48  LAST  701     0102          CM/FLAGS EQUALS STATE +6

0012                      25,2000  77776 1  STARTENT EXIT                  MM = 63
A0013                                                  COME HERE FROM CM/POSE . RESTARTED IN CM/POSE.

0014  REF   1              25,2001  4 2113 1        CS      ENTMASK        INITIALIZE ALL SWITCHES TO ZERO
A0015                                                                      EXCEPT LATSW, ENTRYDSP AND GONEPAST.
A0016                                                                      GONEBY 112D BIT8 FLAG7,SELF INITIALIZING
0017                      25,2002  0 0004 0        INHINT
0018  REF   5  LAST  778  25,2003  7 0102 0        MASK    CM/FLAGS
A0019                                                                      ENTRYDSP = 92D  B13
A0020                                                                      GONEPAST=95D B10,  RELVELSW=96D B9
A0021                                                                      EGSW = 97D  B8
A0022                                                                      HIND=99D B8          INRLSW=100D B5
A0023                                                                      LATSW=101D B4        .05GSW=102D B3

0024  REF   1              25,2004  6 2114 1        AD      ENTRYSW        SET ENTRYDSP, LATSW, GONEPAST.
0025  REF   6  LAST  796  25,2005  54 102 0        TS      CM/FLAGS

0026                      25,2006  0 0003 1        RELINT

0027  REF 204  LAST  785  25,2007  0 6006 1        TC      INTPRET

0028                      25,2010   77735 0        SLOAD
0029  REF   1             25,2011   03011 1                LODPAD
0030  REF   2  LAST  116  25,2012   03626 0        STORE   LOD

0031                      25,2013   77735 0        SLOAD
0032  REF   1             25,2014   03010 0                LADPAD
0033  REF   2  LAST  116  25,2015   03624 1        STORE   LAD

0034                      25,2016   77605 1        DMP                    L/DCMINR = LAD COS(15)
0035  REF   1             25,2017   15320 1                COS15
0036  REF   2  LAST  116  25,2020   17630 1        STODL   L/DCMINR
0037  REF   1             25,2021   15145 0                LATSLOPE
0038                      25,2022   70405 1        DMP     SR1            KLAT = LAD/24
0039  REF   3  LAST  796  25,2023   03624 1                LAD
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0040  REF  2  LAST  116   25,2024  17632 0          STODL  KLAT
0041  REF  1               25,2025  15176 0                 Q7P
0042  REF  2  LAST  276   25,2026  17175 1          STODL  Q7          Q7 = Q7P
0043  REF  1               25,2027  17363 1                 NEARONE     1.0 -1BIT
0044  REF  2  LAST  116   25,2030  17614 1          STODL  FACTOR
0045  REF  4  LAST  798   25,2031  03624 1                 LAD
0046                       25,2032  57565 0          SIGN   DCOMP
0047  REF  6  LAST  747   25,2033  03327 1                 HEADSUP     MAY BE NOISE FOR DISPLAY P61
0048  REF  2  LAST  116   25,2034  37634 1          STCALL L/D         L/D = - LAD SGN(HEADSUP)

0049  REF  2  LAST  744   25,2035  52063 0                 STARTEN1    RETURN VIA GOTOADDR
0050                       25,2036  47375 0          VLOAD  VXV
0051  REF 14  LAST  790   25,2037  01177 1                 VN          (-7) M/CS
0052  REF  4  LAST  789   25,2040  01760 1                 UNITR       .5 UNIT          REF COORDS
0053                       25,2041  50256 0          UNIT   DOT
0054  REF  4  LAST  770   25,2042  03474 0                 RT          RT/2  TARGET VECTOR      REF COORDS
0055  REF  4  LAST  173   25,2043  03676 0          STORE  LATANG      LATANG = UNI.RT /4
0056                       25,2044  47076 0          DCOMP  RTB
0057  REF 13  LAST  403   25,2045  45707 0                 SIGNMPAC
0058  REF  2  LAST  116   25,2046  17644 1          STODL  K2ROLL      K2ROLL = -SGN(LATANG)

0059  REF  5  LAST  799   25,2047  03624 1                 LAD
0060                       25,2050  43205 1          DMP    DAD
0061  REF  1               25,2051  15200 1                 Q21
0062  REF  1               25,2052  15202 0                 Q22
0063  REF  2  LAST  117   25,2053  03712 0          STORE  Q2          Q2 = -1152 + 500 LAD

0064                       25,2054  66331 0          SSP    SSP
0065  REF  3  LAST  752   25,2055  03646 0                 GOTOADDR    SET SELECTOR FOR INITIAL PASS
0066  REF  1               25,2056  52260 1                 INITROLL
0067  REF  4  LAST  749   25,2057  03325 0                 POSEXIT
0068  REF  1               25,2060  52115 0                 SCALEPOP    SET CM/POSE TO CONTINUE AT SCALEPOP

0069                       25,2061  77634 0          RTB
0070  REF  2  LAST  756   25,2062  53603 1                 SERVNOUT    OMIT INITIAL DISPLAY, SINCE 1ST GUESSRAD

R0071  CALCULATE THE INITIAL TARGET VECTOR' RTINIT, ALSO RTEAST, RINORM AND RT.  ALL ARE .5 UNIT AND IN
R0073   REFERENCE COORDINATES.

0074                       25,2063  77220 1  STARTEN1 STQ    VLOAD
0075  REF  4  LAST  799   25,2064  03645 0                 GOTOADDR
0076  REF  6  LAST  634   25,2065  03401 1                 LAT(SPL)    TARGET COORDINATES
0077                       25,2066  43014 0          CLEAR  CLEAR       DO CALL USING PAD RADIUS. WILL UNIT IT.
0076  REF 10  LAST  756   25,2067  00662 0                 ERADFLAG    ANYWAY.
0079  REF 19  LAST  756   25,2070  01663 0                 LUNAFLAG
0080  REF 10  LAST  634   25,2071  15104 0          STODL  LAT
0081  REF  1               25,2072  15332 1                 3ZEROS

0082  REF 11  LAST  799   25,2073  15110 0          STODL  LAT +4      SET ALT=0.
0083  REF 13  LAST  783   25,2074  01205 1                 PIPTIME     ESTABLISH RTINIT AT TIME OF PRESENT
```

L REENTRY CONTROL USER'S PAGE NO. 3 E7 S3

```
A0084
 0085   REF  2  LAST  116   25,2075  37524 0              STCALL TIME/RTO      RN AND VN.
 0086   REF  7  LAST  730   25,2076  26373 1                     LALOTORV      SAVE TIME BASE OF RTINIT.
 0087                       25,2077  77656 1              UNIT                 C(MPAC) =TIME   (P1PTIME)
 0088   REF  8  LAST  798   25,2100  17452 1              STODL  RTINIT        ANSWER IN ALPHAV ALSO
 0089   REF  1              25,2101  12112 0                     500SEC        .5 UNIT TARGET          REF COORDS
A0090                                                                        NOMINAL ENTRY TIME FOR P63
 0091   REF  7  LAST  770   25,2102  37606 0              STCALL DTEAROT       TIME/RTO = P1PTIME, STILL.
 0092   REF  1              25,2103  46215 0                     EARROT1       INITIALIZE EARROT
 0093                       25,2104  72441 0              DOT    SL1           GET RT
 0094   REF  5  LAST  799   25,2105  01760 1                     UNITR         RT/2 IN MPAC
 0095                       25,2106  77726 1              ACOS
 0096   REF  2  LAST  117   25,2107  37702 0              STCALL THETAH        RANGE ANGLE /360
 0097   REF  5  LAST  799   25,2110  03845 0                     GOTOADDR      RETURN TO CALLER

 0098                       25,2111  00003 1  500SEC      2DEC   50000 B-28    CS
 0098                       25,2112  01520 1
 0099                       25,2113  11774 0  ENTMASK     OCT    11774
 0100                       25,2114  11010 0  ENTRYSW     OCT    11010         ENTRYDSP B13, GONEPAST B10, LATSW B4
```

```
P0101
 0102                        25,2115   77624 1  SCALEPOP CALL
 0103  REP   1               25,2116   52125 0                TARGETNG

 0104                        25,2117   77776 1           EXIT

 0105  REP  85  LAST  784    25,2120   0 5301 0  REFAZE10 TC     PHASCHNG
 0106                        25,2121   10035 0           OCT    10035          SERVICER 5.3 RESTART AT REFAZE10

 0107  REP 205  LAST  798    25,2122   0 6006 1          TC     INTPRET

R0108          JUMP TO PARTICULAR RE-ENTRY PHASE'

A0109                                          SEQUENCE
 0110                        25,2123   77650 1          GOTO
 0111  REP   6  LAST  800    25,2124   03645 0                GOTOADDR

R0112

R0113          GOTOADDR  CONTAINS THE ADDRESS OF THE ROLL COMMAND EQUATIONS APPROPRIATE TO THE CURRENT PHASE OF
R0115  RE-ENTRY.  SEQUENCING IS AS FOLLOWS'

R0116  INITROLL ADDRESS IS SET HERE INITIALLY. HOLDS INITIAL ROLL ATTITUDE UNTIL KAT  IS EXCEEDED. THEN HOLDS NEW ROLL
R0118          ATTITUDE UNTIL  VRTHRESH  IS EXCEEDED.  THEN BRANCHES TO

R0119  HUNTEST  THIS SECTION CHECKS TO SEE IF THE PREDICTED RANGE AT NOMINAL  L/D FROM PRESENT CONDITIONS IS LESS
R0121          THAN THE DESIRED RANGE.
R0122            IF NOT - A ROLL COMMAND IS GENERATED BY THE CONSTANT DRAG CONTROLLER.
R0124            IF SO -  CONTROL AND GOTOADDR ARE SET TO  UPCONTRL.
R0125          USUALLY NO ITERATION IS INVOLVED EXCEPT IF THE RANGE DESIRED IS TOO LONG ON THE FIRST PASS THROUGH
R0127          HUNTEST.

R0128  UPCONTRL CONTROLS ROLL DURING THE SUPER-CIRCULAR PHASE.  UPCONTRL IS TERMINATED EITHER
R0130            (A)  WHEN THE DRAG (AS MEASURED BY THE PIPAS) FALLS BELOW Q7 ,  OR
R0132            (B)  IF RDOT IS NEGATIVE AND REFERENCE VL EXCEEDS V.
R0133          IN CASE (A),  GOTOADDR  IS SET TO  KEP2  AND IN CASE (B), TO PREDICT3  SKIPPING THE KEPLER PHASE OF
R0135          ENTRY.

R0136  KEP2    GOTOADDR IS SET HERE DURING THE KEPLER PHASE TO MONITOR DRAG. THE SPACECRAFT IS INSTANTANEOUSLY
R0138          TRIMMED IN PITCH AND YAW TO THE COMPUTED RELATIVE VELOCITY. THE LAST COMPUTED ROLL ANGLE IS MAINTAINED.
R0140          WHEN THE MEASURED DRAG EXCEEDS Q7 +0.5,  GOTOADDR  IS SET TO

R0141  PREDICT3 THIS CONTROLS THE FINAL SUB-ORBITAL PHASE. ROLL COMMANDS CEASE
R0142          WHEN  V  IS LESS THAN VQUIT. AN EXIT IS MADE TO

R0143  P67.1    THE LAST COMPUTED ROLL ANGLE IS MAINTAINED. RATE DAMPING IS DONE IN PITCH AND YAW. PRESENT LATITUDE
R0145          AND LONGITUDE ARE COMPUTED FOR DISPLAY.
R0146          ENTRY IS TERMINATED WHEN DISKY RESPONSE IS MADE TO TO THIS FINAL FLASHING DISPLAY.
```

```
P0146   PROCESS AVERAGE G OUTPUT...SCALE IT AND GET INPUT DATA
R0149

R0150   * START  TARGETING ...

 0151   REF   9  LAST  600   E7,1451                    EBANK= RTINIT

A0152                                                  TARGETNG IS CALLED BY P81, FROM GROUP 4.
A0153                                                  TARGETNG IS CALLED BY ENTRY, FROM GROUP 5.

A0154
 0155                          25,2125   77214 0  TARGETNG BOFF   VLOAD      ALL MM COME HERE.
 0156   REF   1                25,2126   03346 0                 RELVELSW    ENTER WITH PROPER EB FROM CM/POSE(TEST)
 0157   REF   1                25,2127   52133 1                 GETVEL      RELVELSW = 96D  BIT9
 0158   REF   2  LAST  116     25,2130   03526 0                 -VREL       WANT INERTIAL VEL. GO GET IT.
                                                                              NEW V  IS RELATIVE, CONTINUE
 0159                          25,2131   52076 1          VCOMP  GOTO        (VREL) = (V) + KWE UNITR*UNITW
 0160   REF   1                25,2132   52136 1                 GETUNITV -1 - VREL WAS LEFT BY CM/POSE

 0161                          25,2133   74375 0  GETVEL  VLOAD  VXSC        INERTIAL V WANTED
 0162   REF  15  LAST  799     25,2134   01177 1                 VN          KVSCALE = (12800 / .3046) / 2VS
 0163   REF   1                25,2135   15230 1                 KVSCALE     KVSCALE = .61491944
 0164   REF   2  LAST  116     25,2136   03516 0          STORE  VEL         V/2 VS

 0165                          25,2137   44056 1  GETUNITV UNIT  STQ
 0166   REF   6  LAST  770     25,2140   03373 0                 60GENRET
 0167   REF   2  LAST  116     25,2141   17510 0          STODL  UNITV
 0166                          25,2142   00043 0                 34D
 0169   REF   2  LAST  116     25,2143   03622 1          STORE  VSQUARE     VSQ/4

 0170                          25,2144   77625 0          DSU                LEQ = VSQUARE - 1
 0171   REF   1                25,2145   15322 0                 FOURTH      4 G-S FULL SCALE
 0172   REF   2  LAST  116     25,2146   17654 0          STODL  LEQ         LEQ/4

 0173                          25,2147   00045 0                 36D
 0174   REF   2  LAST  117     25,2150   27674 1          STOVL  V           V/2 VS = VEL/2 VS

 0175   REF   3  LAST  802     25,2151   03516 0                 VEL
 0176                          25,2152   72441 0          DOT    SL1         RDOT= V.UNITR
 0177   REF   6  LAST  600     25,2153   01760 1                 UNITR
 0176   REF   3  LAST  276     25,2154   27700 0          STOVL  RDOT        RDOT / 2 VS

 0179   REF  10  LAST  790     25,2155   01163 1                 DELV        PIPA COUNTS IN PLATFORM COORDS.
 0180                          25,2156   41246 1          ABVAL  DMP
 0161   REF   1                25,2157   15232 0                 KASCALE
 0162                          25,2160   53152 1          SL1    BZE
 0163   REF   1                25,2161   55132 1                 SETMIND
 0164   REF   3  LAST  275     25,2162   27640 0  DSTORE STOVL   D           ACCELERATION USED TO APPROX DRAG
 0185   REF   4  LAST  602     25,2163   03516 0                 VEL
 0186                          25,2164   53435 0          VXV    UNIT        UNI = UNIT(V*R)
```

```
0187  REF  7  LAST  802   25,2165  01760 1                  UNITR
0188  REF  4  LAST  786   25,2188  03502 0          STORE   UNI        .5 UNI              REF COORDS.

0189                      25,2167  71214 0          BOFF    DLOAD
0190  REF  2  LAST  802   25,2170  03346 0                  RELVELSW
0191  REF  1             25,2171  55073 0                  GETETA
0192  REF  2  LAST  799   25,2172  15332 1                  3ZEROS
0193                      25,2173  43225 0  UPDATERT DSU    DAD        PIPTIME-TIME/RTO =ELAPSED TIME SINCE
A0194                                                                  RTINIT  WAS ESTABLISHED.
0195  REF  3  LAST  800   25,2174  03524 1                  TIME/RTO
0196  REF  14 LAST  799   25,2175  01205 1                  PIPTIME
0197  REF  8  LAST  800   25,2178  37608 0          STCALL  DTEAROT    GET PREDICTED TARGET VECTOR  RT

0198  REF  3  LAST  770   25,2177  46225 0                  EARROT2
0199                      25,2200  40241 1          DOT     SETPD      SINCE (RT) UNIT VECT, THIS IS 1/4 MAX
0200  REF  5  LAST  803   25,2201  03502 0                  UNI        LATANG = RT.UNI
0201                      25,2202  00001 0                  0
0202  REF  5  LAST  799   25,2203  27878 0          STOVL   LATANG     LATANG = MAC LATANG / 4

0203  REF  5  LAST  799   25,2204  03474 0                  RT
0204                      25,2205  77814 1          CLEAR
0205  REF  1             25,2206  03867 0                  GONEBY     SHOW HAVE NOT GONE PAST TARGET.
0206                      25,2207  50235 0          VXV     DOT        IF RT*UNITR.UNI NEG, GONEBY=1
0207  REF  8  LAST  803   25,2210  01780 1                  UNITR      GONEPAST IS CONDITIONAL SW SET IN
0208  REF  8  LAST  803   25,2211  03502 0                  UNI        FINAL PHASE.
0209                      25,2212  43044 0          BPL     SET
0210                      25,2213  52215 0                  +2
0211  REF  2  LAST  803   25,2214  03467 1                  GONEBY     SHOW HAVE      GONE PAST TARGET.

0212                      25,2215  77775 1          VLOAD
0213  REF  6  LAST  803   25,2218  03474 0                  RT
0214                      25,2217  45241 1  GETANGLE DOT    DSU        THETA = ARCCOS(RT.UNITR)
0215  REF  9  LAST  803   25,2220  01760 1                  UNITR
0216  REF  1             25,2221  15162 0                  NEAR1/4    TO IMPROVE ACCURACY, CALC RANGE BY
0217                      25,2222  43244 1          BPL     DAD        TINYTHET IF HIGH ORDER PART OF
0218  REF  1             25,2223  55135 0                  TINYTHET   ARCCOS ARGUMENT IS ZERO
0219  REF  2  LAST  803   25,2224  15162 0                  NEAR1/4
0220                      25,2225  85552 0          SL1     ACOS
0221  REF  3  LAST  800   25,2226  03702 1  THETDONE STORE  THETAH     THETAH/360
A0222                                                                 HI WORD, LO BIT =1.32 NM=360 80/16384

0223                      25,2227  57414 1          BCN     DCOMP
0224  REF  3  LAST  803   25,2230  03707 1                  GONEBY     =1 IF HAVE GONE PAST TARGET.
A0225                                                                 (SIGN MAY BECOME ERRATIC VERY NEAR
A0226                                                                 TARGET DUE TO LOSS OF PRECISION.)
0227                      25,2231  52232 0                  +1
0228  REF  2  LAST  276   25,2232  17714 0          STODL   RTGON87    RANGE ERROR' NEG IF WILL FALL SHORT.

0229  REF  4  LAST  802   25,2233  03640 0                  D
0230                      25,2234  50025 0          DSU     BMN
```

L REENTRY CONTROL

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```
0231  REP  1                25,2235  15240 0                  .05G
0232  REP  1                25,2236  52255 1                  NO.05G
0233                        25,2237  77214 0          SET     VLOAD
0234  REP  1                25,2240  03074 1                  .05GSW
0235  REP  8  LAST  790     25,2241  03433 0                  DELVREP
0236                        25,2242  50208 0          PUSH    DOT
0237  REP  5  LAST  772     25,2243  03542 1                  UXA/2
0238                        25,2244  63552 0          SL1     DSQ
0239                        25,2245  47515 0          PDVL    VSQ          EXCHANGE WITH PDL.
0240                        25,2246  56225 1          DSU     DDV
0241                        25,2247  00001 0                  0
0242                        25,2250  75400 1          BOV     SQRT
0243  REP  1                25,2251  52253 1                  NOLDCALC
0244  REP  1                25,2252  03727 0          STORE   L/DCALC      OVFL LAST CLEARED IN EARROT2 ABOVE.
0245                        25,2253  77650 1  NOLDCALC GOTO
0246  REP  7  LAST  802     25,2254  03373 0                  60GENRET
0247                        25,2255  52014 0  NO.05G  CLEAR   GOTO         THIS WAY FOR DAP.(MAY INTERRUPT)
0248  REP  2  LAST  804     25,2256  03274 0                  .05GSW       .05GSW = 102D  B3
0249  REP  2  LAST  804     25,2257  52253 1                  NOLDCALC     KEEP SINGLE EXIT FOR TARGETING
```

P0250 SUBROUTINES CALLED BY SCALEPOP (TARGETING)'

```
0251                          26,3073                    BANK    26
0252  REF  1                 26,2000                    SETLOC  REENTRY1
0253                          26,3073                    BANK

0254  REF  1                                            COUNT*  $$/ENTRY

0255                          26,3073   56345 0  GETETA  DLOAD   DDV       D = D +D(-RDOT/HS -2D/V)  DT/2
A0256                                                                     DT/2  =  2/2  = 1
0257  REF  4  LAST  602       26,3074   03700 0          DMP     RDOT
0256  REF  1                 26,3075   15314 0          .       -HSCALED
0259                          26,3076   41325 0          PDDL    DMP
0260  REF  5  LAST  603       26,3077   03640 0          .       D
0261  REF  1                 26,3100   15316 1          .       -KSCALE
0262                          26,3101   43271 1          DDV     DAD
0263  REF  3  LAST  602       26,3102   03674 1          .       V
A0264                                                                     -RDOT/HS FROM PDL.
0265                          26,3103   43205 1          DMP     DAD
0266  REF  6  LAST  605       26,3104   03640 0          .       D
0267  REF  7  LAST  605       26,3105   03640 0          .       D
0266  REF  8  LAST  605       26,3106   03640 0          STORE   D

0269                          26,3107   71214 0          BON     DLOAD     EGSW INDICATES FINAL PHASE.
0270  REF  2  LAST   56       26,3110   03307 0          .       EGSW
0271  REF  1                 26,3111   55116 1          .       SUBETA
0272  REF  4  LAST  603       26,3112   03702 1          .       THETAH
0273                          26,3113   52005 0          DMP     GOTO
0274  REF  1                 26,3114   15234 0          .       KTETA     = 1000X2PI/(2)E14 163.64
0275  REF  1                 26,3115   52173 0          .       UPDATERT

0276                          26,3116   45345 1  SUBETA  DLOAD   DSU       SWITCH FROM  INERTIAL TO RELATIVE VEL.
0277  REF  4  LAST  605       26,3117   03674 1          .       V
0276  REF  1                 26,3120   15322 0          .       VMIN
0279                          26,3121   43044 0          BPL     SET
0260  REF  1                 26,3122   55124 0          .       SUBETA2
0261  REF  3  LAST  603       26,3123   03066 1          .       RELVELSW

0282                          26,3124   41345 0  SUBETA2 DLOAD   DMP

0283  REF  5  LAST  605       26,3125   03702 1          .       THETAH
0284  REF  1                 26,3126   15236 1          .       KT1       KT1 = KT
0285                          26,3127   52071 0          DDV     GOTO
0266  REF  5  LAST  605       26,3130   03674 1          .       V         KT = RE(2 PI)/2 VS 16384 163.84/ 2 VSAT
0267  REF  2  LAST  605       26,3131   52173 0          .       UPDATERT

0266                          26,3132   52145 0  SETMIND DLOAD   GOTO
0289  REF  2  LAST  634       26,3133   16326 1          .       1BITDP
0290  REF  1                 26,3134   52162 0          .       DSTORE
```

L REENTRY CONTROL


```
0291
0292  REF  3  LAST  805   26,3135  51425 0  TINYTHET DSU    ABS       ENTER WITH X-.249
0293                      26,3136  16327 0                 1BITDP + 1  GET 1/4 - MPAC
0294                      26,3137  75461 0          SL     SQRT      SCALE UP BEFORE SQRT
0295                      26,3140  20216 0                 13D       HAS FACTOR FOR UP SCALING
0296  REF  1              26,3141  52005 0          DMP    GOTO
0297  REF  1              26,3142  15246 0                 KACOS
                          26,3143  52226 0                 THETDONE
```

```
P0298   * START   INITIAL ROLL  ...

 0299                          25,2280                    BANK   25
 0300   REF  2 LAST  798       25,2000                    SETLOC REENTRY
 0301                          25,2280                    BANK

 0302   REF  2 LAST  798 TO  805'   176   176*           COUNT* $$/ENTRY

A0303                                                                  MM = 63 , 64 ..
 0304                          25,2280   43014 0 INITROLL BON    BOFF  IF D- .05G NEG, GO TO LIMITL/D
 0305   REF  1                 25,2281   03312 1                INRLSW
 0306   REF  1                 25,2282   52354 1                INITRL1
 0307   REF  3 LAST  804       25,2283   03354 0                .05GSW
 0308   REF  1                 25,2284   53520 0                LIMITL/D

A0309                                                                  MM = 64, NOW

A0310                                                                  KA = KA1 LEQ^3 + KA2
A0311
 0312                          25,2285   83545 0          DLOAD DSQ
 0313   REF  3 LAST  802       25,2286   03654 0                LEQ
 0314                          25,2287   56205 0          DMP   DDV
 0315   REF  4 LAST  807       25,2290   03654 0                LEQ
 0316   REF  1                 25,2291   15304 1                1/KA1          = 25 /(84  1.8)
 0317                          25,2292   47015 0          DAD   RTB
 0318   REF  1                 25,2293   15306 0                KA2            = .2
 0319   REF  1                 25,2294   54432 0                P64            ROLLC        VI           RDOT
A0320                                                                          XXX.XX DEG   XXXXX. FPS   XXXXX. FPS
 0321   REF  2 LAST  117       25,2295   03720 1          STORE KAT

 0322                          25,2296   45345 1          DLOAD DSU             IF V-VPINAL1 NEG, GO TO FINAL PHASE.
 0323   REF  6 LAST  805       25,2297   03674 1                V
 0324   REF  1                 25,2300   15302 1                VPINAL1
 0325                          25,2301   51014 0          CLEAR BPL             (CAN=T CLEAR INRLSW AFTER HERE'RESTARTS)
 0326   REF  1                 25,2302   03265 0                GONEPAST       GONEPAST WAS INITIALLY SET=1 TO FORCE
A0327                                                                          ROLLC TO REMAIN AS DEFINED BY HEADSUP
A0328                                                                          UNTIL START OF P64. (UNTIL D δ .05G)
 0329   REF  1                 25,2303   52310 1                D0EQ
 0330                          25,2304   52131 0          SSP   GOTO
 0331   REF  7 LAST  801       25,2305   03646 0                GOTOADDR
 0332   REF  1                 25,2308   53311 1                KEP2           AND IDLE UNTIL DS0.2 G.  (NO P66 HERE)
 0333   REF  1                 25,2307   52343 1                INRCLOUT       GO TO LIMITL/D AFTER SETTING INRLSW.

 0334                          25,2310   41345 0 D0EQ     DLOAD DMP            D0 = KA3 LEQ + KA4
 0335   REF  5 LAST  807       25,2311   03654 0                LEQ
 0336   REF  1                 25,2312   15310 1                KA3
 0337                          25,2313   77615 0          DAD
 0338   REF  1                 25,2314   15312 0                KA4
 0339   REF  2 LAST  117       25,2315   03710 1          STORE D0              D0/805
 0340                          25,2316   40065 0          BDDV  BOV
```

L REENTRY CONTROL

```
0341  REF  1                25,2317  15266 1                C001          (-4/25 G)  B-8
0342                        25,2320  52321 0                +1            CLEAR OVFIND, IF ON.
0343  REF  2  LAST  117     25,2321  17706 0          STODL C/D0          (-4/D0)  B-8
0344  REF  6  LAST  799     25,2322  03624 1                LAD           IF V-VPINAL +K(RDOT/V)CUBED POS,L/D=-LAD
0345  REF  3  LAST  799     25,2323  17634 0          STODL L/D
0346  REF  5  LAST  805     25,2324  03700 0                RDOT
0347                        25,2325  41471 0          DDV   PUSH
0348  REF  7  LAST  807     25,2326  03674 1                V
0349                        25,2327  41316 0          DSQ   DMP
0350                        25,2330  45271 1          DDV   DSU
0351  REF  1                25,2331  15276 0                1/K44
0352  REF  1                25,2332  15300 0                VPINAL
A0353
A0354                                                                  3
                                                                      V-VPINAL +(RDOT/V)  / K44   OVFL $
0355
0356  REF  8  LAST  808     25,2333  40015 1          DAD   BOV
0357  REF  2  LAST  807     25,2334  03674 1                V
0358                        25,2335  52343 1                INROLOUT      GO TO LIMITL/D AFTER SETTING INRLSW.
0359  REF  3  LAST  808     25,2336  71240 1          BMN   DLOAD
0360  REF  7  LAST  808     25,2337  52343 1                INROLOUT      GO TO LIMITL/D AFTER SETTING INRLSW.
0361                        25,2340  03624 1                LAD
0362  REF  4  LAST  808     25,2341  77676 0          DCOMP
                            25,2342  03634 0          STORE L/D
A0363
0364                                                                  SET INRLSW AT END FOR RESTART PROTECTION
                            25,2343  77614 1  INROLOUT BOFSET
0365  REF  2  LAST  807     25,2344  03052 0                INRLSW        END OF PRE .05G PATH OF INITROLL.
0366  REF  2  LAST  807     25,2345  53520 0                LIMITL/D      SWITCH IS ZERO INITIALLY.
                                                                      (GO TO)
0367
                            25,2346  45345 1  KATEST  DLOAD DSU          IF KAT - D POS, GO TO CONSTD
0368  REF  3  LAST  807     25,2347  03720 1                KAT
0369  REF  9  LAST  805     25,2350  03640 0                D             IF POS, OUT WITH COMMAND VIA LIMITL/D
0370                        25,2351  52044 0          BPL   GOTO
0371  REF  3  LAST  808     25,2352  53520 0                LIMITL/D
0372  REF  1                25,2353  53224 0                CONSTD
0373
                            25,2354  43345 1  INITRL1 DLOAD DAD          IF RDOT + VRCONT POS, GO TO HUNTEST
0374  REF  6  LAST  808     25,2355  03700 0                RDOT
0375  REF  1                25,2356  15260 1                VRCONT
0376                        25,2357  45040 1          BMN   CALL          IF POSITIVE, FALL INTO HUNTEST.
0377  REF  1                25,2360  52346 1                KATEST

03771 REF  1                25,2361  53014 1                FOREHUNT      INITIALIZE HUNTEST.
```

```
P0378   * START   HUNT TEST   ..

A0379                                                          MM = 64
 0380                    25,2382  77731 1          SSP          INITIALIZE HUNTEST ON FIRST PASS
 0381   REP   6  LAST 807 25,2383  03646 0                GOTOADDR
 0382   REP   1           25,2384  52365 0                HUNTEST      MUST GO AFTER FOREHUNT FOR RESTARTS.

 0389                    25,2385  77745 1  HUNTEST DLOAD
 0390   REP  10  LAST 808 25,2386  03640 0                D
 0391   REP   2  LAST 117 25,2387  17684 0          STODL A1          A1/805  = A1/ 25G

 0392   REP   8  LAST 808 25,2370  03824 1                LAD
 0393   REP   2  LAST 116 25,2371  17647 1          STODL TEM1B
 0394   REP   7  LAST 808 25,2372  03700 0                RDOT
 0395                    25,2373  71240 1          BMN   DLOAD      IF RDOT NEG,TEM1B=LAD, OTHERWISE = LEWD
 0396   REP   1           25,2374  52400 1                A0CALC
 0397   REP   1           25,2375  03725 1                LEWD
 0398   REP   3  LAST 809 25,2376  17647 1          STODL TEM1B

 0399   REP   6  LAST 809 25,2377  03700 0                RDOT
 0400                    25,2400  43271 1  A0CALC DDV     DAD      V1 = V + RDOT/TEM1B
 0401   REP   4  LAST 809 25,2401  03647 1                TEM1B
 0402   REP   9  LAST 808 25,2402  03674 1                V
 0403   REP   2  LAST  70 25,2403  14328 0          STODL V1         V1/2 VS

 0404   REP   9  LAST 809 25,2404  03700 0                RDOT
 0405                    25,2405  56318 0          DSQ   DDV      A0=(V1/V)SQ(D+RDOT SQ/(TEM1B 2 C1 HS)
 0406   REP   5  LAST 809 25,2408  03647 1                TEM1B
 0407                    25,2407  43271 1          DDV   DAD
 0408   REP   1           25,2410  15272 1                2C1HS
 0409   REP  11  LAST 809 25,2411  03640 0                D
 0410                    25,2412  41205 0          DMP   DMP
 0411   REP   3  LAST 809 25,2413  00328 0                V1
 0412   REP   4  LAST 809 25,2414  00326 0                V1
 0413                    25,2415  77871 1          DDV
 0414   REP   3  LAST 802 25,2418  03622 1                VSQUARE
 0415   REP   1           25,2417  14330 1          STODL A0         A0/805  = A0/ 25G

 0416   REP  10  LAST 809 25,2420  03700 0                RDOT
 0417                    25,2421  71244 0          BPL   DLOAD
 0418   REP   1           25,2422  52425 0                V1LEAD
 0419   REP   2  LAST 809 25,2423  00330 1                A0
 0420   REP   3  LAST 809 25,2424  03664 0          STORE A1         A1/25G

 04202                   25,2425  51145 0  V1LEAD DLOAD  BPL      IF L/D NEG, V1=V1 - 1000
 04203  REP   5  LAST 808 25,2428  03634 0                L/D
 04204  REP   1           25,2427  52434 0                HUNTEST1

 04205                   25,2430  45345 1          DLOAD DSU
 04206  REP   5  LAST 809 25,2431  00328 0                V1
```

```
04207  REF  1                25,2432  15214 1                    VQUIT
04206  REF  6  LAST  609     25,2433  00326 0          STORE     V1

0421                         25,2434  41345 0  HUNTEST1  DLOAD   DMP          ALP = 2 C1 HS A0/LEWD V1 V1
0422   REF  3  LAST  609     25,2435  00330 1                    A0
0423   REF  2  LAST  609     25,2436  15272 1                    2C1HS
0424                         25,2437  40271 1           DDV      SETPD
0425   REF  7  LAST  610     25,2440  00326 0                    V1
0426                         25,2441  00001 0                    0
0427                         25,2442  56271 0           DDV      DDV
0428   REF  6  LAST  810     25,2443  00326 0                    V1
0429   REF  2  LAST  609     25,2444  03725 1                    LEWD
0430   REF  2  LAST  117     25,2445  03704 1           STORE    ALP

0431                         25,2446  55221 0           BDSU     BDDV         PACT1 = V1 / (1 - ALP)
0432   REF  1                25,2447  17363 1                    BARELY1
0433   REF  9  LAST  610     25,2450  00326 0                    V1
0434   REF  2  LAST  116     25,2451  17616 0           STODL    PACT1        PACT1 / 2VS

0435   REF  3  LAST  610     25,2452  03704 1                    ALP
0436                         25,2453  41225 1           DSU      DMP          PACT2 = ALP(ALP - 1) / A0
0437   REF  2  LAST  610     25,2454  17363 1                    BARELY1
0438   REF  4  LAST  610     25,2455  03704 1                    ALP
0439                         25,2456  77671 1           DDV
0440   REF  4  LAST  610     25,2457  00330 1                    A0
0441   REF  2  LAST  116     25,2460  03620 0           STORE    PACT2        PACT2  (25G)

0442                         25,2461  43205 1           DMP      DAD
0443   REF  3  LAST  799     25,2462  03175 1                    Q7           Q7 /805 = Q7 / 25G
0444   REF  5  LAST  610     25,2463  03704 1                    ALP          VL=PACT1 (1-SQRT(Q7 PACT2 +ALP)  )
0445                         25,2464  44366 1           SQRT     BDSU
0446   REF  3  LAST  610     25,2465  17363 1                    BARELY1
0447                         25,2466  77605 1           DMP
0448   REF  3  LAST  610     25,2467  03616 0                    PACT1
0449   REF  2  LAST  276     25,2470  03767 1           STORE    VL           VL / 2 VS

0450                         25,2471  41221 0           BDSU     DMP          GAMMAL1 = LEWD (V1-VL)/VL
0451   REF  10 LAST  610     25,2472  00326 0                    V1
0452   REF  3  LAST  810     25,2473  03725 1                    LEWD
0453                         25,2474  77671 1           DDV
0454   REF  3  LAST  610     25,2475  03767 1                    VL
0455   REF  1                25,2476  14027 1           STODL    GAMMAL1      GAMMAL1 USED IN UPCONTROL

A0456                                                             GAMMAL1 = PDL 22D.
0457   REF  4  LAST  610     25,2477  03767 1                    VL
0458                         25,2500  50025 0           DSU      BMN          IF VL-VLMIN NEG, GO TO PREFINAL
0459   REF  1                25,2501  15204 0                    VLMIN
0460   REF  1                25,2502  53325 0                    PREFINAL

0461                         25,2503  63545 0           DLOAD    DSQ
```

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0482  REP  5 LAST 610   25,2504  03767 1                 VL
0483  REP  2 LAST 117   25,2505  17666 1          STODL  VBARS          VBARS / 4 VS VS

0484  REP  1            25,2506  15330 0                 VALVS         IF VSAT-VL NEG,  GO TO CONSTD
0485                     25,2507  50025 0          DSU    BMN
0486  REP  6 LAST 811   25,2510  03767 1                 VL
0487  REP  1            25,2511  53220 1                 RESCONSTD     SET MODE=HUNTEST, CONTINUE IN CONSTD
0488  REP  2 LAST 117   25,2512  17662 0          STODL  DVL           DVL / 2VS

0489  REP  2 LAST 611   25,2513  15330 0                 VALVS
0490  REP  2 LAST 117   25,2514  03672 1          STORE  VS1           VS1 = VSAT

0491                     25,2515  50025 0          DSU    BMN           IF V1 GREATER THAN VSAT , GO ON
0492  REP 11 LAST 610   25,2516  00326 0                 V1
0493  REP  1            25,2517  52525 1                 GETDHOOK
0494                     25,2520  77621 1          BDSU
0495  REP  3 LAST 811   25,2521  03662 0                 DVL
0496  REP  4 LAST 811   25,2522  17662 0          STODL  DVL           DVL = DVL - (VSAT-V1) = V1 - VL
0497  REP 12 LAST 611   25,2523  00326 0                 V1
0498  REP  3 LAST 811   25,2524  03672 1          STORE  VS1           VS1 = V1,  IN THIS CASE

0499                     25,2525  45145 0  GETDHOOK DLOAD  CALL        DHOOK=((1-VS1/FACT1) SQ -ALP)/FACT2
0500  REP  4 LAST 811   25,2526  03672 1                 VS1           VS1 /2 VS
0501  REP  1            25,2527  52776 0                 DHOOKYQ7      GO CALC DHOOK
0502  REP  2 LAST 116   25,2530  03656 1          STORE  DHOOK         DHOOK /256

0503                     25,2531  56261 1          SR     DDV
0504                     25,2532  20607 1                 6             CHOOK
0505  REP  4 LAST 610   25,2533  03175 1                 CH7
0506                     25,2534  77625 0          DSU
0507  REP  1            25,2535  15250 1                 CHOOK         = .25/16 = (-6)
0508  REP  2 LAST 117   25,2536  03660 1          STORE  AHOOKDV

0509                     25,2537  41215 1          DAD    DMP           GAMMAL= GAMMAL1-CH1 DVL SQ(1+AHOOK DVL)
0510  REP  1            25,2540  17357 0                 1/16TH
0511  REP  1            25,2541  15254 0                 CH1
0512                     25,2542  41205 0          DMP    DMP
0513  REP  5 LAST 811   25,2543  03662 0                 DVL
0514  REP  6 LAST 811   25,2544  03662 0                 DVL
0515                     25,2545  56271 0          DDV    DDV
0516  REP  3 LAST 811   25,2546  03656 1                 DHOOK
0517  REP  3 LAST 811   25,2547  03666 1                 VBARS
0518                     25,2550  50021 1          BDSU   BMN
0519  REP  2 LAST 810   25,2551  00027 1                 GAMMAL1
0520  REP  1            25,2552  52743 0                 XSCHMA
0521  REP  1            25,2553  03771 0  HUNTEST3 STORE  GAMMAL

0522                     25,2554  77625 0          DSU                  GAMMAL1=GAMMAL1 +Q19 (GAMMAL-GAMMAL1)
0523  REP  3 LAST 811   25,2555  00027 1                 GAMMAL1
0524                     25,2556  43205 1          DMP    DMP
```

L REENTRY CONTROL


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0505  REP  1                25,2557   15330 0                Q19
0506  REP  4  LAST  811      25,2560   00027 1                GAMMAL1
0507  REP  5  LAST  812      25,2561   14027 1          STODL GAMMAL1
0508  REP  2  LAST  811      25,2562   03771 0                GAMMAL
```

```
P0509    *START    RANGE PREDICTION ...

A0510                                                          C(MPAC) = GAMMAL
 0511                          25,2563  60516 0  RANGER  DSQ    SR2      COSG = 1-GAMMAL SQ/2, TRUNCATED SERIES
 0512                          25,2564  77621 1          BDSU
 0513  REF  3  LAST  611      25,2565  15330 0                HALVE
 0514  REF  2  LAST  117      25,2566  17670 0          STODL COSG/2
 0515  REF  4  LAST  611      25,2567  03666 1                VBARS    E=SQRT(1+VBARS.....

 0516                          25,2570  41225 1          DSU    DMP
 0517  REF  4  LAST  613      25,2571  15330 0                HALVE
 0518  REF  5  LAST  613      25,2572  03666 1                VBARS
 0519                          25,2573  41205 0          DMP    DMP
 0520  REF  3  LAST  613      25,2574  03670 0                COSG/2
 0521  REF  4  LAST  613      25,2575  03670 0                COSG/2
 0522                          25,2576  43312 0          SL2    DAD
 0523  REF  1                  25,2577  17357 0                C1/16    C1/16 = 1/16
 0524                          25,2600  65366 1          SQRT   PDDL     E/4 INTO PDL

 0525  REF  6  LAST  613      25,2601  03666 1                VBARS
 0526                          25,2602  41205 0          DMP    DMP      ASKEP/2 = ARCSIN(VBARS COSG SING/E)
 0527  REF  5  LAST  613      25,2603  03670 0                COSG/2
 0528  REF  3  LAST  612      25,2604  03771 0                GAMMAL
 0529                          25,2605  67471 1          DDV    ASIN
 0530                          25,2606  41552 0          SL1    PUSH     ASKEP TO PDL 0.
 0531  REF  1                  25,2607  17731 1          STODL  ASKEP    BALLISTIC RANGE      ASKEP/2PI

A0532                                                                FOR TM, STORE RANGE COMPONENTS OVERLAPPING (SP)
 0533  REF  7  LAST  611      25,2610  03767 1                VL
 0534                          25,2611  43205 1          DMP    DAD      ASP1 = Q2 + Q3 VL
 0535  REF  1                  25,2612  15170 0                Q3
 0536  REF  3  LAST  799      25,2613  03712 0                Q2
 0537  REF  1                  25,2614  03732 1          STORE  ASP1     FINAL PHASE RANGE    ASP1/2 PI

 0538                          25,2615  63525 0          PDDL   DSQ      ASP1 TO PDL 2.
 0539  REF 13  LAST  811      25,2616  00328 0                V1
A0540                                                                                  2
A0541                                                          ASPUP= -C12 LOG(V1 Q7/VBARS A0)/GAMMAL1
 0542                          25,2617  56205 0          DMP    DDV
 0543  REF  5  LAST  611      25,2620  03175 1                Q7
 0544  REF  7  LAST  613      25,2621  03666 1                VBARS
 0545                          25,2622  45071 0          DDV    CALL
 0546  REF  5  LAST  810      25,2623  00330 1                A0
 0547  REF  1                  25,2624  46155 1                LOG      RETURN WITH -LOG IN MPAC

 0548                          25,2625  56205 0          DMP    DDV
 0549  REF  1                  25,2626  15206 1                C12
 0550  REF  6  LAST  812      25,2627  00027 1                GAMMAL1
 0551  REF  1                  25,2630  03733 0          STORE  ASPUP    UP PHASE RANGE       ASPUP / 2 PI
```

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```
                                                                                    ASPUP TO PDL 4.
                                                                                    KC3 =-4 VS VS/ 2 PI 805 RE
                                                                                    ASPDWN = KC3 RDOT V / A0
                                                                                    ASPDWN TO PDL 6.
                                                                                    RANGE TO PULL OUT          ASPDWN /2 PI
                                                                                    ASP3 = Q5(Q6-GAMMAL)
                                                                                    GAMMA CORRECTION           ASP3/2PI
                                                                                    GET HI-WD AND
                                                                                    SAVE HI-WORD OF ASP=S FOR TM.
                                                                                    ASPDWN FROM PDL 6.
                                                                                    ASPUP FROM PDL 4.
                                                                                    ASP1 FROM PDL 2.
                                                                                    ASKEP FROM PDL 0.
                                                                                    CLEAR OVPIND.
                                                                                    DIFF = (ASP-THETAH) /2 PI
                                                                                        ASP=ASKEP+ASP1+ASPUP+ASP3+ASPDWN = TOTAL RANGE
                                                                                    IF ABS(THETAH-ASP) -25NM NEG, GO TO UPSY
                                                                                    EVENTUALLY SETS MODE = RUNTEST.
                                                                                    DLEWD = DLEWD (DIFF/(DIFFOLD-DIFF))
```

0552					25,2831	41325 0		PDDL	DMP
0553	REP	1			25,2832	15256 1			KC3
A0554									
0555	REP	11	LAST	809	25,2833	03700 0			RDOT
0556					25,2834	56205 0		DMP	DDV
0557	REP	10	LAST	609	25,2835	03674 1			V
0558	REP	6	LAST	813	25,2838	00330 1			A0
0559					25,2837	41471 0		DDV	PUSH
0560	REP	9	LAST	809	25,2840	03824 1			LAD
0561	REP	1			25,2841	17734 1		STODL	ASPDWN
0562	REP	1			25,2842	15174 1			Q6
0563					25,2843	41225 1		DSU	DMP
0564	REP	4	LAST	813	25,2844	03771 0			GAMMAL
0565	REP	1			25,2845	15172 1			Q5
0566	REP	1			25,2846	27735 0		STOVL	ASP3
0567	REP	2	LAST	813	25,2847	03731 1			ASKEP
0568	REP	1			25,2850	17128 1		STODL	ASPS(TM)
0569	REP	2	LAST	814	25,2851	03735 0			ASP3
0570					25,2852	43215 0		DAD	DAD
A0571									
A0572									
0573					25,2853	43215 0		DAD	DAD
A0574									
A0575									
0576					25,2854	41025 0		DSU	BOVB
0577	REP	6	LAST	605	25,2855	03702 1			THETAH
0578	REP	3	LAST	758	25,2856	57343 1			TCDANZIG
0579	REP	2	LAST	116	25,2857	03610 0		STORE	DIFF
A0560									
0581					25,2880	45246 0		ABS	DSU
0582	REP	1			25,2881	15222 1			25NM
0563					25,2882	43040 1		BMN	BON
0584	REP	1			25,2883	53025 0			GOTOUPSY
0585	REP	1			25,2884	03311 1			HIND
0586	REP	1			25,2885	52871 0			GETDLEWD
0587					25,2886	51145 0		DLOAD	BPL
0588	REP	3	LAST	614	25,2887	03610 0			DIFF
0589	REP	1			25,2670	53213 1			DCONSTD
0590					25,2671	41345 0	GETDLEWD	DLOAD	DMP
A0591									
0592	REP	2	LAST	116	25,2872	03642 1			DLEWD
0593	REP	4	LAST	814	25,2673	03810 0			DIFF
0594					25,2874	45325 1		PDDL	DSU
0595	REP	2	LAST	118	25,2875	03812 1			DIFFOLD
0596	REP	5	LAST	814	25,2876	03810 0			DIFF

```
0597                          25,2677   77665 1            BDDV
05971                         25,2700   77826 0  LWDSTORE  STADR
0598   NEXT  3  LAST  814     25,2701   74135 0            STORE   DLEWD
0599                          25,2702   50015 0            DAD     BMN       IF LEWD+DLEWD NEG,DLEWD=-LEWD/2
0600   NEXT  4  LAST  810     25,2703   03725 1                    LEWD
06002  NEXT  1                25,2704   52737 0                    LEWDPTR
06004                         25,2705   77800 1            BOV
0601   NEXT  1                25,2708   52733 1                    LEWDOVFL
0602   NEXT  5  LAST  815     25,2707   03725 1            STORE   LEWD

0603                          25,2710   77776 1  SIDETRAK  EXIT

0604   NEXT  2  LAST  758     25,2711   3 4753 1           CA      EBENTRY
0605   NEXT  34 LAST  758     25,2712   54 003 0           TS      EBANK

06051  NEXT  10 LAST  381     25,2713   3 4783 1           CA      PRIO16    DROP GRP 5 RESTART PRIO TO 1 LESS THAN
06052  NEXT  1                25,2714   55=084 0           TS      PHSPRDT5  GRP 4.

0606   NEXT  06 LAST  801     25,2715   0 5301 0           TC      PHASCHNG
0607                          25,2716    00474 0           OCT     00474     RESTART GRP 4 AT PRE-HUNT.
A06071                                                                     FORCE RESTART TO PICK UP IN GRP 4'
A06072                                                                     USE PRIO 17 FOR GRP 4( ± SERVICER PRIO)
0608   NEXT  11 LAST  815     25,2717   3 4763 1           CA      PRIO16    CONTINUE GRP 5 AT LOWER PRIO THAN EITHER
A06081                                                                     GRP 4 OR SERVICER.
0609   NEXT  9  LAST  648     25,2720   0 5103 0           TC      PRIOCHNG

0610   NEXT  1                25,2721   3 3024 1           CAF     ADENDEXT  SIDETRACK NEXT PASS UNTIL THIS ONE DONE.
0611   NEXT  9  LAST  809     25,2722   55=645 0           TS      GOTOADDR  ONLY AFTER RESTART IS LEFT AFTER DETOUR.

0612   NEXT  206 LAST 801     25,2723   0 6008 1           TC      INTPRET

0613                          25,2724    43145 0           DLOAD   SET
0614   NEXT  6  LAST  814     25,2725    03610 0                   DIFF
0615   NEXT  2  LAST  814     25,2726    03071 1                   HIND
0616   NEXT  3  LAST  814     25,2727    17612 1           STODL   DIFFOLD    DIFFOLD / 2 PI

0617   NEXT  2  LAST  799     25,2730    15178 0                   Q7P
0621   NEXT  6  LAST  813     25,2731    37175 0           STCALL  Q7        Q7 / 805 FPSS
0622   NEXT  2  LAST  809     25,2732    52365 0                   HUNTEST    (GO TO )

0623                          25,2733    77745 1  LEWDOVFL DLOAD
0624   NEXT  2  LAST  799     25,2734    17363 1                   NEARONE
0625   NEXT  6  LAST  815     25,2735    37725 0           STCALL  LEWD
0626   NEXT  2  LAST  814     25,2736    53213 1                   DCONSTD   (GO TO)  ALSO WILL SET MODE = HUNTEST

06262                         25,2737    70545 1  LEWDPTR  DLOAD  SR1
06264  NEXT  7  LAST  815     25,2740    03725 1                   LEWD
06266                         25,2741    52076 1           DCOMP   GOTO
06268  NEXT  1                25,2742    52700 1                   LWDSTORE
```

R0627 NEGAMA IS PART OF HUNTEST ...

```
0828                                25,2743  41205 0  NEGAMA   DMP     DMP          ENTER WITH GAMMAL IN MPAC
0829  REF   8  LAST  813            25,2744  03767 1                   VL
0830  REF   1                       25,2745  15146 0                   1/3RD
0831                                25,2746  41325 0           PDDL    DMP          PUSH GAMMAL VL/3
0832  REF   8  LAST  615            25,2747  03725 1                   LEWD
0833  REF   2  LAST  818            25,2750  15146 0                   1/3RD
0834                                25,2751  43325 1           PDDL    DAD          PUSH LEWD/3
0835  REF   3  LAST  611            25,2752  03660 1                   AHOOKDV
0836  REF   1                       25,2753  15252 0                   1/24TH
0837                                25,2754  41205 0           DMP     DMP          DEL VL =(GAMMAL VL/3)/(LEWD/3-DVL
0838  REF   7  LAST  611            25,2755  03662 0                   DVL          (2/3 + AHOOKDV)(CH1 GS/DHOOK VL))
0839  REF   2  LAST  811            25,2756  15254 0                   CH1
0840                                25,2757  56271 0           DDV     DDV
0841  REF   4  LAST  811            25,2760  03656 1                   DHOOK
0842  REF   9  LAST  818            25,2761  03767 1                   VL
0843                                25,2762  55221 0           BDSU    BDDV         LEWD/3
A0844                                                                   GAMMAL VL /3
A0845
0846                                25,2763  77615 0           DAD
0847  REF  10  LAST  818            25,2764  03767 1                   VL
0848  REF  11  LAST  616            25,2765  37767 0           STCALL  VL           VL/2 VS

0849  REF   2  LAST  811            25,2766  52776 0                   DHOOKYQ7     GO CALC Q7
A0850                                                                  Q7=((1-VL/FACT1)SQ - ALP)/FACT2
0851  REF   7  LAST  815            25,2767  17175 1           STODL   Q7           Q7 / 25G

0852  REF  12  LAST  818            25,2770  03767 1                   VL
0853                                25,2771  77716 1           DSQ
0854  REF   8  LAST  613            25,2772  17666 1           STODL   VBARS        VBARS / 4 VS VS

0855  REF   3  LAST  603            25,2773  15332 1                   3ZEROS
0856                                25,2774  77650 1           GOTO
0857  REF   1                       25,2775  52553 0                   HUNTEST3     SET GAMMAL = 0

0858                                25,2776  56342 1  DHOOKYQ7 SR1     DDV          SUBROUTINE TO CALC DHOOK OR Q7)
0859  REF   4  LAST  610            25,2777  03616 0                   FACT1
0860                                25,3000  72421 0           BDSU    SL1
0861  REF   5  LAST  613            25,3001  15330 0                   HALVE
0862                                25,3002  45316 1           DSQ     DSU
0863  REF   6  LAST  810            25,3003  03704 1                   ALP
0864                                25,3004  43471 1           DDV     RVQ
0865  REF   3  LAST  810            25,3005  03620 0                   FACT2
```

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P06651
A0666                                          COME TO PRE-HUNT WHEN RESTART OCCURS AFTER
A0667                                          HUNTEST IS SIDE-TRACKED AT SIDETRAK.
A0668                                          PICK UP IN GROUP 4.

 0669   REF 207  LAST  815   25,3006  0 6006 1  PRE-HUNT TC      INTPRET
 0670                        25,3007   45014 0            CLEAR   CALL
 0671   REF   3  LAST  815   25,3010   03271 0                    HIND          HIND      99D  BIT 6  FLAG 8
 0672   REF   2  LAST  808   25,3011   53014 1                    FOREHUNT      RE-INITIALIZE HUNTEST AFTER RE-START.
 0673                        25,3012   77650 1            GOTO
 0675   REF   3  LAST  815   25,3013   52385 0                    HUNTEST
 0676                        25,3014   77745 1  FOREHUNT DLOAD                 INITIALIZE HUNTEST.
 0677   REF   4  LAST  816   25,3015   15332 1                    3ZEROS
 0678   REF   4  LAST  815   25,3016   17612 1            STODL   DIFFOLD
 0679   REF   1               25,3017   15156 1                    DLEWD0
 0680   REF   4  LAST  815   25,3020   17642 1            STODL   DLEWD
 0681   REF   1               25,3021   15150 1                    LEWD1
 0682   REF   9  LAST  816   25,3022   03725 1            STORE   LEWD
 0683                        25,3023   77616 0            RVQ
A0684
 0685   REF   2  LAST  748   25,3024   53570 0  ADENDEXT CADR    ENDEXIT
```

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P0686   * START  UP CONTROL  ...

A0687
 0688                        25,3025   77634 0  GOTOUPSY RTB
 0689   REF   1              25,3028   54440 0                   P65
A0690
A0691
A0692
A0693

 0694                        25,3027   45345 1  UPCONTRL DLOAD   DSU
 06941  REF  12  LAST  809   25,3030   03840 0                   D
 06942  REF   1              25,3031   15220 0                   C21
 06943                       25,3032   43040 1           BMN     SET
 06944                       25,3033   53035 1                   +2
 06945  REF   1              25,3034   03070 0                   NOSWITCH

 06946                       25,3035   45345 1           DLOAD   DSU
 0695   REF  11  LAST  614   25,3036   03674 1                   V
 0696   REF  14  LAST  613   25,3037   00328 0                   V1
 0697                        25,3040   71244 0           BPL     DLOAD
 0698   REF   1              25,3041   53252 1                   DOWNCNTL
 0699   REF  13  LAST  818   25,3042   03640 0                   D
 0700                        25,3043   50025 0           DSU     BMN
 0701   REF   6  LAST  616   25,3044   03175 1                   Q7
 0702   REF   1              25,3045   53305 1                   KEP
 0703                        25,3046   51145 0           DLOAD   BPL
 0704   REF  12  LAST  614   25,3047   03700 0                   RDOT
 0705   REF   1              25,3050   53057 0                   CONT1

 0706                        25,3051   45345 1  VLTEST   DLOAD   DSU
 0707   REF  12  LAST  616   25,3052   03674 1                   V
 0708   REF  13  LAST  816   25,3053   03767 1                   VL
 0709                        25,3054   50025 0           DSU     BMN
 0710   REF   1              25,3055   15184 0                   C18
 0711   REF   2  LAST  810   25,3058   53325 0                   PREFINAL

 0712                        25,3057   77745 1  CONT1    DLOAD
 0713   REF  14  LAST  618   25,3080   03840 0                   D
 0714                        25,3081   50025 0           DSU     BMN
 0715   REF   7  LAST  814   25,3082   00330 1                   A0
 0716   REF   1              25,3083   53087 0                   CONT3
 0717                        25,3064   52145 0           DLOAD   GOTO
 0718   REF  10  LAST  814   25,3085   03824 1                   LAD
 0719   REF   1              25,3066   53517 1                   STOREL/D
A0720

 0721                        25,3087   41345 0  CONT3    DLOAD   DMP
 0722   REF  15  LAST  818   25,3070   03640 0                   D
 0723   REF   4  LAST  818   25,3071   03620 0                   FACT2
```

```
MM = 65
END OF HUNTEST
HUNTEST USE OF GRP4 IS DISABLED BY P65
USE FOR DISPLAY.
SET MODE = UPCONTRL.
RETURN FROM P65 DIRECTLY TO UPCONTRL
VIA THE GOTOADDR AT REPAZE10.

IF D-140 POS, NOSWITCH =1
(SUPPRESS LATERAL SWITCH)

IF  V-V1  POS, GO TO DOWN CONTROL.

IF D- Q7 NEG, GO TO KEP

IF RDOT NEG, DO VLTEST

IF V-VL-C16 NEG,EGSW=1,MODE=PREDICT3

IF D-A0 POS, L/D = LAD, GO TO LIMITL/D

VREF=FACT1(1-SQRT(FACT2 D + A1.P))
```

```
0724                          25,3072  75415 0          DAD     SQRT
0725  REP  7  LAST  616      25,3073  03704 1                  ALP
0726                          25,3074  41221 0          BDSU    DMP
0727  REP  4  LAST  810      25,3075  17363 1                  BARELY1
0728  REP  5  LAST  616      25,3076  03618 0                  FACT1
0729  REP  1                 25,3077  01160 1          STORE   VREF          VREF / 2VS

0730                          25,3100  41221 0          BDSU    DMP           RDOTREF = LEWD(V1-VREF)
0731  REP 15  LAST  818       25,3101  00326 0                  V1
0732  REP 10  LAST  817       25,3102  03725 1                  LEWD
0733  REP  2  LAST   77       25,3103  15156 1          STODL   RDOTREF       RDOTREF / 2VS

0734  REP  5  LAST  811       25,3104  03672 1                  VS1
0735                          25,3105  50025 0          DSU     BMN           IF VSAT-VREF NEG, GO TO CONTINU2
0736  REP  2  LAST  819       25,3106  01160 1                  VREF
0737  REP  1                 25,3107  53126 1                  CONTINU2

0738                          25,3110  41406 0          PUSH    PUSH          VS1-VREF  TO PDL TWICE
0739                          25,3111  56205 0          DMP     DDV           RDHOOK=CH1(1+DV AHOOKDV/DVL) DV DV
0740  REP  4  LAST  816       25,3112  03660 1                  AHOOKDV             /DHOOK VREF
0741  REP  8  LAST  816       25,3113  03662 0                  DVL           WHERE  DV = (VS1-VREF)
0742                          25,3114  41215 1          DAD     DMP
0743  REP  2  LAST  811       25,3115  17357 0                  1/16TH
0744  REP  3  LAST  816       25,3116  15254 0                  CH1
0745                          25,3117  41205 0          DMP     DMP
A0746                                                           VS1-VREF  FROM PDL TWICE.
0747                          25,3120  77671 1          DDV
0748  REP  5  LAST  818       25,3121  03656 1                  DHOOK
0749                          25,3122  44271 0          DDV     BDSU
0750  REP  3  LAST  819       25,3123  01160 1                  VREF
0751  REP  3  LAST  819       25,3124  01156 1                  RDOTREF       C(RDOTREF)= LEWD (V1-VREF)
0752  REP  4  LAST  819       25,3125  01156 1          STORE   RDOTREF       RDOTREF = RDOTREF - RDHOOK

0753                          25,3126  45345 1  CONTINU2 DLOAD   DSU
0754  REP 16  LAST  818       25,3127  03640 0                  D
0755  REP  1                 25,3130  15312 0                  Q7MIN
0756                          25,3131  50004 0          BOVB    BMN
0757  REP  4  LAST  814       25,3132  57343 1                  TCDANZIG      CLEAR OVFL IND, IF ON.
0758  REP  1                 25,3133  53144 0                  UPCNTRL3
0759                          25,3134  45345 1          DLOAD   DSU
0760  REP  4  LAST  809       25,3135  03664 0                  A1
0761  REP  9  LAST  818       25,3136  03175 1                  Q7
0762                          25,3137  45325 1          PDDL    DSU
0763  REP 17  LAST  819       25,3140  03640 0                  D
0764  REP 10  LAST  819       25,3141  03175 1                  Q7
0765                          25,3142  45471 1          DDV     STADR
0766  REP  3  LAST  799       25,3143  74163 0          STORE   FACTOR        FACTOR / 25G
```

L REENTRY CONTROL

P0767 SKIPPER

A0768
A0769 DELTA L/D=-((RDOT-RDOTREF)F_1 KB_1+V-VREF)F_1 KB_2
WHERE F_1 = FACTOR

0770					25,3144	77745 1	UPCNTRL3	DLOAD	
0771	REP	13	LAST	818	25,3145	03700 0			RDOT
0772					25,3146	41225 1		DSU	DMP
0773	REP	5	LAST	619	25,3147	01156 1			RDOTREF
0774	REP	4	LAST	619	25,3150	03614 1			FACTOR
0775					25,3151	43271 1		DDV	DAD
0776	REP	1			25,3152	15210 0			$1/KB_1$
0777	REP	13	LAST	618	25,3153	03674 1			V
0778					25,3154	41225 1		DSU	DMP
0779	REP	4	LAST	619	25,3155	01160 1			VREF
0780	REP	5	LAST	620	25,3156	03614 1			FACTOR
0781					25,3157	41471 0		DDV	PUSH
0782	REP	1			25,3160	15212 1			$-1/KB_2$
0783					25,3161	51400 1		BOV	ABS
0784	REP	1			25,3162	53464 1			GOMAXL/D
0785					25,3163	50025 0		DSU	BMN
0786	REP	1			25,3164	15274 1			$PT_1/16$
0787	REP	1			25,3165	53172 0			NEXT1
0788					25,3166	43205 1		DMP	DAD
0789	REP	1			25,3167	15152 0			$POINT_1$
0790	REP	2	LAST	620	25,3170	15274 1			$PT_1/16$
0791					25,3171	41565 1		SIGN	PUSH
0792					25,3172	42545 0	NEXT1	DLOAD	SL4
A0793									
0794					25,3173	77615 0		DAD	
0795	REP	11	LAST	619	25,3174	03725 1			LEWD
0796					25,3175	41400 0	NEGTESTS	BOV	PUSH
0797	REP	2	LAST	620	25,3176	53484 1			GOMAXL/D
0798	REP	6	LAST	809	25,3177	17634 0		STODL	L/D
A0799									
A0800									
0801	REP	18	LAST	819	25,3200	03640 0			D
0802					25,3201	50025 0		DSU	BMN
0803	REP	1			25,3202	15218 0			C_{20}
0804	REP	4	LAST	808	25,3203	53520 0			LIMITL/D
0805					25,3204	71214 0		CLEAR	DLOAD
0806	REP	1			25,3205	03273 1			LATSW
A0807									
0808					25,3206	71244 0		BPL	DLOAD
0809	REP	5	LAST	820	25,3207	53520 0			LIMITL/D
0810	REP	5	LAST	817	25,3210	15332 1			3ZEROS
0811	REP	7	LAST	820	25,3211	37634 1		STCALL	L/D
0812	REP	6	LAST	820	25,3212	53520 0			LIMITL/D

L/D = LEWD
$-((RDOT-RDOTREF)F_1/KB_1+V-VREF)F_1/KB_2$

DELTA L/D INTO PDL
NONLINEAR CIRCUIT FOR REDUCING HIGH GAIN

ATTACH SIGN OF PUSH TO MPAC THEN PUSH

DELTA L/D FROM PDL.

L/D TO PDL FOR USE IN NEGTESTS.

IF D-C_{20} POS, LATSW =0
AND IF L/D NEG, L/D = 0.

=21D. ROLL OVER TOP, REGARDLESS.
L/D FROM PDL.

(GO TO)

```
0813                          25,3213  77745 1  DCONSTD  DLOAD
0814  REP  7  LAST  815        25,3214  03610 0                   DIFF
A0815
0817  REP  5  LAST  817        25,3215  17612 1           STODL   DIFFOLD
0818  REP  3  LAST  815        25,3218  15178 0                   Q7P
0819  REP 11  LAST  819        25,3217  03175 1           STORE   Q7

0820                          25,3220  47131 1  BECONSTD SSP     RTB
0821  REP 10  LAST  815        25,3221  03646 0                   GOTOADDR
0822  REP  4  LAST  817        25,3222  52365 0                   HUNTEST
0823  REP  1                   25,3223  54505 0                   KILLGRP4

0824                          25,3224  77604 0  CONSTD   BOVB
0825  REP  5  LAST  819        25,3225  57343 1                   TCDANZIG

0826                          25,3226  41345 0           DLOAD   DMP
0827  REP  6  LAST  807        25,3227  03654 0                   LEQ
0828  REP  3  LAST  808        25,3230  03706 0                   C/D0
0829                          25,3231  41325 0           PDDL    DMP
0830  REP  1                   25,3232  15262 0                   2HS
0831  REP  3  LAST  807        25,3233  03710 1                   D0
0832                          25,3234  43271 1           DDV     DAD
0833  REP 14  LAST  820        25,3235  03674 1                   V
0834  REP 14  LAST  820        25,3236  03700 0                   RDOT
0835                          25,3237  43205 1           DMP     DAD
0836  REP  1                   25,3240  15226 0                   K2D
0837                          25,3241  77725 1           PDDL
0838  REP  4  LAST  821        25,3242  03710 1                   D0

0839                          25,3243  77621 1  CONSTD1  BDSU
0840  REP 19  LAST  820        25,3244  03640 0                   D
0841                          25,3245  43205 1           DMP     DAD
0842  REP  1                   25,3246  15224 1                   K1D
0843                          25,3247  52061 1           SL      GOTO
0844                          25,3250  20211 1                   8D
0845  REP  1                   25,3251  53175 1                   NEGTESTS
0848                          25,3252  77604 0  DOWNCNTL BOVB
0847  REP  6  LAST  821        25,3253  57343 1                   TCDANZIG

0848                          25,3254  54345 1           DLOAD   SR
0849  REP 11  LAST  818        25,3255  03624 1                   LAD
0850                          25,3256  20611 0                   8D
0851                          25,3257  45325 1           PDDL    DSU
0852  REP 15  LAST  821        25,3260  03674 1                   V
0853  REP 16  LAST  819        25,3261  00328 0                   V1
0854                          25,3262  43205 1           DMP     DAD
0855  REP 12  LAST  821        25,3263  03624 1                   LAD
```

TWO RANGER ENTRIES TO CONSTD HERE

SAVE OLD VALUE OF DIFF FOR NEXT PASS.

DIFFOLD / 2 PI

A HUNTEST ENTRY INTO CONSTD.

RESET MODE TO HUNTEST

DEACTIVATE GRP4 FROM HUNTEST.

CLEAR OVF IND IF ON.

$C/D_0 = -4/D_0$ B-8

LEQ C/D_0 INTO PDL

2HS / 4 VS VS

RDOTREF = - 2 HS D_0/V

C/D_0 LEQ + K_2D(RDOT-RDOTREF) INTO PD

D_0 /805

ENTER WITH DREF IN MPAC

K_2D TERM FROM PUSH

(GO TO)

INITIAL PART OF UPCONTROL.

CLEAR OVFIND , IF ON.

RDTR = LAD(V_1-V)

L REENTRY CONTROL

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```
0656  REP  15  LAST  821   25,3284  03700 0          RDOT
0657                       25,3285  43205 1   DMP    DAD
0858  REP   2  LAST  821   25,3286  15226 0          K2D
A0859
0860                       25,3287  45325 1   PDDL   DSU          PUSH UP LAD.
0861  REP  17  LAST  821   25,3270  00328 0          V1           LAD + K2D(RDOT-RDTR) INTO PD
0862  REP  16  LAST  821   25,3271  03674 1          V
0863                       25,3272  41316 0   DSQ    DMP
0864  REP  13  LAST  821   25,3273  03624 1          LAD
0865                       25,3274  65271 0   DDV    PDDL         (V1-V)SQ LAD/(2 C1 HS) INTO PD
0866  REP   3  LAST  810   25,3275  15272 1          2C1HS
0867  REP  16  LAST  622   25,3276  00326 0          V1
0868                       25,3277  56316 0   DSQ    DDV
0869  REP   4  LAST  809   25,3300  03622 1          VSQUARE
0870                       25,3301  45265 1   BDDV   DSU          DREP = (V/V1)SQ A0 - PD
0671  REP   8  LAST  818   25,3302  00330 1          A0
A0872
0673                       25,3303  77650 1   GOTO                PUSH UP HERE
0674  REP   1               25,3304  53243 1          CONSTD1      C(MPAC) = DREP

A0875
A0876
```

$$DREP = (V/V_1)^2 A_0 - (V-V_1)^2 LAD/2\ C_1\ HS$$

```
L       REENTRY CONTROL

P0877   * START  BALLISTIC PHASE  ...

A0878                                                                   MM = 66      UPCONTRL ENTRY INTO KEP2.
 0879                          25,3305   66234 1  KEP      RTB   SSP
 0880   REP   1               25,3308   54473 0                  P68             DISPLAY TRIM GIMBAL ANGLE VALUES.
 0881   REP  11  LAST  821     25,3307   03848 0                  GOTOADDR        SET GOTOADDR TO KEPLER PHASE.
 0882   REP   2  LAST  807     25,3310   53311 1                  KEP2

A0883                                                                   KEP2 CAN ALSO BE STARTED UP DIRECTLY FROM INITROLL
A0884                                                                   IN P64. PROGRAM WILL IDLE IN P64 UNTIL D EXCEEDS
A0885                                                                   .2 G BEFORE GOING ON TO P67.

 0886                          25,3311   45345 1  KEP2     DLOAD DSU             IF Q7P+KDMIN -D NEG,GO TO FINAL PHASE.
 0887   REP   1               25,3312   15188 1                  Q7PKDMIN        (Q7P + KDMIN)/805
 0888   REP  20  LAST  821     25,3313   03840 0                  D
 0889                          25,3314   72240 1           BMN    TLOAD
 0891   REP   3  LAST  818     25,3315   53325 0                  PREPINAL
A0892                                                                   SET ROLLHOLD = ROLLC, IN CASE CMDAPMOD
 0893   REP   9  LAST  772     25,3318   03318 0                  ROLLC           = +1 EVER ENTERED.
 0895                          25,3317   72214 0           BON    TLOAD           IF D ≤ .05G, KEEP PRESENT ROLL COMMAND.
 0896   REP   4  LAST  807     25,3320   03314 1                  .05GSW          IF D ± .05G, SET ROLL COMMAND = 0.
 0897                          25,3321   53323 0                  +2
 0898   REP   6  LAST  820     25,3322   15332 1                  3ZEROS          SET ROLLC & ROLLHOLD =0.
 0899   REP  10  LAST  823     25,3323   37318 1  +2       STCALL ROLLC           (SP ROLLHOLD FOLLOWS DP ROLLC)
 0900   REP   3  LAST  748     25,3324   54402 0                  P62.3           CALC DESIRED GIMBAL ANGLES AT PRESENT
A0901                                                                   RN, VN  TO YIELD TRIM ATTITUDE.
A0902                                                                   AVAILABLE IN CPHI/S FOR N22.
```

```
P0903   START  FINAL  PHASE  ..

A0904
 0905                          25,3325   47131 1  PREFINAL SSP    RTB
 0906   REF  12  LAST  623     25,3326   03848 0                  GOTOADDR
 0907   REF   4  LAST  823     25,3327   53325 0                  PREFINAL
 0908   REF   1                25,3330   54477 1                  P67
A0909
A0910
A0911
A0912

 0913                          25,3331   68214 0        SET       SSP
 0914   REF   3  LAST  805     25,3332   03067 0                  EGSW
 0915   REF  13  LAST  824     25,3333   03848 0                  GOTOADDR
 0918   REF   1                25,3334   53335 1                  PREDICT3
 0917                          25,3335   45345 1  PREDICT3 DLOAD  DSU
 0916   REF  17  LAST  622     25,3338   03674 1                  V
 0919   REF   2  LAST  810     25,3337   15214 1                  VQUIT
 0920                          25,3340   77440 1        BMN       EXIT
 0921   REF   1                25,3341   53605 1                  STEEROFF

 0922   REF   3  LAST  815     25,3342   3 4753 1       CA        ERENTRY
 0923   REF  35  LAST  815     25,3343   54 003 0       TS        ERANK

 0924   REF   1                25,3344   3 5856 1       CA        TWELVE
 0925   REF   1                25,3345   55∝771 0 BACK  TS        JJ

 0926   REF  16  LAST  624     25,3346   4 1873 0       CS        V
 0927   REF   2  LAST  624     25,3347   51∝771 1       INDEX     JJ
 0928   REF   1                25,3350   8 3831 0       AD        VREFER
 0929   REF 184  LAST  782     25,3351   10 000 0       CCS       A
 0930   REF   3  LAST  824     25,3352   11∝771 0       CCS       JJ
 0931   REF   1                25,3353   1 3345 1       TCF       BACK
 0932   REF  96  LAST  778     25,3354   6 4712 1       AD        ONE
 0933   REF   6  LAST  809     25,3355   55∝646 0       TS        TEM1B

 0934   REF   4  LAST  824     25,3358   51∝771 1       INDEX     JJ
 0935   REF   2  LAST  824     25,3357   4 3831 1       CS        VREFER
 0938   REF   5  LAST  824     25,3360   51∝771 1       INDEX     JJ
 0937   REF   3  LAST  824     25,3361   8 3632 0       AD        VREFER + 1
 0938   REF   7  LAST  624     25,3382   57∝848 1       XCH       TEM1B
 0939                          25,3383   22 007 0       ZL
 0940                          25,3384   0 0008 1       EXTEND
 0941   REF   8  LAST  824     25,3365   11∝848 0       DV        TEM1B
 0942   REF   2  LAST  116     25,3388   55∝651 0       TS        GRAD

 0943   REF  19  LAST  779     25,3367   3 4715 0       CAF       FIVE
```

MM = 67

RESTART PROTECT' RESET GOTOADDR IF CAME FROM HUNTEST.
DISABLES GRP4. FINE IF FROM HUNTEST.BUT MAY ALSO REMOVE RESTART PROTECTION OF N69 (P65).

ROLLC	XRNGERR	DNRNGERR
XXX.XX DEG	XXXX.X NM	XXXX.X NM

IF V-VQUIT NEG, STOP STEERING

PRECAUTIONARY.

VREF - V, HIGHEST VREF AT END OF TABLE.
IF VREF-V POS LOOP BACK
DECREMENT JJ , JJ CANNOT BE ZERO

V-VREF IN TEM_1B (MUST BE POSITIVE NUM)

$V(K+1) - V(K)$ (POS NUM)

GRAD = (V-VREF)/(VK+1 - VK) (POS NUM

```
0944  REF   5  LAST  745   25,3370  55∝650 1  BACK2   TS      MM
0945  REF   2  LAST  785   25,3371  3 4720 0           CAF     THIRTEEN
0946  REF   6  LAST  824   25,3372  27∝771 0           ADS     JJ
0947  REF 185  LAST  824   25,3373  50 000 1           INDEX   A
0948  REF   4  LAST  824   25,3374  4 3831 1           CS      VREFER
0949  REF   7  LAST  825   25,3375  51∝771 1           INDEX   JJ
0950  REF   5  LAST  825   25,3378  6 3832 0           AD      VREFER + 1      X(K+1) - X(K)
0951                       25,3377  0 0006 1           EXTEND
0952  REF   3  LAST  824   25,3400  7 1651 0           MP      GRAD
0953  REF   8  LAST  825   25,3401  51∝771 1           INDEX   JJ
0954  REF   6  LAST  825   25,3402  6 3831 0           AD      VREFER
0955  REF   6  LAST  825   25,3403  51∝650 0           INDEX   MM
0956  REF   2  LAST  118   25,3404  55∝852 0           TS      PX              PX = AK + GRAD (AK+1 - AK)
0957  REF   7  LAST  825   25,3405  11∝650 1           CCS     MM
0958  REF   1               25,3406  1 3370 1           TCF     BACK2
0959  REF   3  LAST  825   25,3407  57∝653 0           XCH     PX +1           ZERO PX +1  AND GET DREFR
0960  REF  21  LAST  823   25,3410  6 1637 1           AD      D
0961                       25,3411  0 0006 1           EXTEND
0962  REF   4  LAST  825   25,3412  7 1657 0           MP      PX + 5          F1
0963  REF 280  LAST  782   25,3413  52 155 1           DXCH    MPAC            MPAC = F1(D-DREF)

0964                       25,3414  0 0006 1           EXTEND
0965  REF  16  LAST  822   25,3415  4 1700 0           DCS     RDOT            FORM RDOTREF - RDOT
0966                       25,3418  20 001 1           DDOUBL
0967                       25,3417  20 001 1           DDOUBL
0968                       25,3420  20 001 1           DDOUBL                  SCALE UP BY 8 FOR THIS PHASE.
0969  REF   5  LAST  825   25,3421  6 1655 0           AD      PX + 3          RDOTREF
0970                       25,3422  0 0006 1           EXTEND
0971  REF   6  LAST  825   25,3423  7 1658 1           MP      PX + 4          F2
0972  REF   7  LAST  825   25,3424  6 1654 1           AD      PX +2           RTOGO
0973  REF 281  LAST  825   25,3425  20 155 1           DAS     MPAC            ADD F2(DADV1-DADVR)
0974  REF 282  LAST  825   25,3426  3 0154 1           CA      MPAC
0975  REF   2  LAST  117   25,3427  55∝770 1           TS      PREDANG
A0976                                                                         L/D = LOD +(THETA- PREDANG)/ Y
0977  REF 208  LAST  817   25,3430  0 0008 1           TC      INTPRET

0978                       25,3431  45242 1            SR3     DSU
0979  REF   7  LAST  814   25,3432  03702 1                    THETAH
0980                       25,3433  43014 0            BCN     BOFF
0981  REF   2  LAST  807   25,3434  03305 1                    GONEPAST
0982  REF   1               25,3435  53482 1                    GONEGLAD
0983  REF   4  LAST  803   25,3438  03747 0                    GONEBY
0984  REF   1               25,3437  53445 1                    HAVDNRNG
0985                       25,3440  43145 0            DLOAD   SET             SET GONEPAST IF GONEBY SET & LATCH IN -
0986  REF   1               25,3441  13765 1                    MAXRNG          DISPLAY = 9999.9 IF GONEBY          PLACE
0987  REF   3  LAST  825   25,3442  03085 1                    GONEPAST
0988  REF   3  LAST  278   25,3443  37718 0            STCALL  DNRNGERR
0989  REF   2  LAST  625   25,3444  53462 1                    GONEGLAD

0990  REF   4  LAST  825   25,3445  03718 1  HAVDNRNG  STORE   DNRNGERR        = (PREDANG - THETA) /360
```

L REENTRY CONTROL

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```
0991                          25,3446  77676 0            DCOMP
0993                          25,3447  56204 1            BOVB   DDV
0994  REP  7  LAST  821       25,3450  57343 1                   TCDANZIG
0995  REP  8  LAST  825       25,3451  03653 1                   PX
0996                          25,3452  40061 1            SL     BOV
0997                          25,3453  20206 1                   5
0998  REP  3  LAST  820       25,3454  53464 1                   GOMAXL/D
0999                          25,3455  40015 1            DAD    BOV
1000  REP  3  LAST  798       25,3456  03626 0                   LOD
1001  REP  4  LAST  826       25,3457  53464 1                   GOMAXL/D
1002  REP  8  LAST  820       25,3460  37634 1            STCALL L/D
1003  REP  1                 25,3461  53470 1                   GLIMITER

R1004 GONEGLAD AND GOPOSMAX ENTRY POINTS FOR GLIMITER ...

1005                          25,3462  77745 1  GONEGLAD DLOAD
1006  REP  3  LAST  825       25,3463  13463 1                   GONEGLAD

1007                          25,3464  41234 1  GOMAXL/D RTB    DMP
1008  REP 14  LAST  799       25,3465  45707 0                   SIGNMPAC
1009  REP 14  LAST  822       25,3466  03624 1                   LAD
1010  REP  9  LAST  826       25,3467  03634 0            STORE  L/D

1011                          25,3470  45345 1  GLIMITER DLOAD  DSU
1012  REP  1                  25,3471  15160 1                   GMAX/2
1013  REP 22  LAST  825       25,3472  03640 0                   D
1014                          25,3473  43244 1            BPL    DAD
1015  REP  7  LAST  820       25,3474  53520 0                   LIMITL/D
1016  REP  2  LAST  826       25,3475  15160 1                   GMAX/2
1017                          25,3476  41240 1            BMN    DMP
1018  REP  1                  25,3477  53515 0                   GOPOSLAD
1019  REP  2  LAST  821       25,3500  15262 0                   2HS
1020                          25,3501  41325 0            PDDL   DMP
1021  REP  7  LAST  821       25,3502  03654 0                   LEQ
1022  REP  1                  25,3503  15330 0                   1/GMAX
1023                          25,3504  41215 1            DAD    DMP
1024  REP 15  LAST  826       25,3505  03624 1                   LAD
1025                          25,3506  56325 0            PDDL   DDV
1026  REP  1                  25,3507  15264 0                   2HSGMXSQ
1027  REP  5  LAST  822       25,3510  03622 1                   VSQUARE
1028                          25,3511  75415 0            DAD    SQRT
1029                          25,3512  51015 1            DAD    BPL
1030  REP 17  LAST  825       25,3513  03700 0                   RDOT
1031  REP  8  LAST  826       25,3514  53520 0                   LIMITL/D

1032                          25,3515  77745 1  GOPOSLAD DLOAD
1033  REP 16  LAST  826       25,3516  03624 1                   LAD
1034  REP 10  LAST  826       25,3517  03634 0  STOREL/D STORE   L/D
```

```
                        FALL SHORT IF NEG, OVERSHOOT IF POS

CLEAR OVFIND IF ON.
PX= DRANGE/D L/D = Y

(GO TO)

SET L/D = -LAD
(ANY NEGATIVE NUMBER WILL DO)

L/D = LAD SIGN(MPAC)

AND FALL INTO GLIMITER SECTION

IF GMAX/2-D POS, GO TO LIMITL/D

IF GMAX  -D NEG, GO TO GOPOSLAD

2HS(GMAX-D) INTO PD

2HS(GMAX-D) (LEQ/GMAX+LAD) INTO PD

XLIM = SQRT(PD+(2HSGMAX/V)SQ)
IF RDOT+XLIM POS, GO TO LIMITL/D
```

```
1035                          25,3520  77745 1  LIMITL/D DLOAD
1036  REF  11  LAST  626      25,3521  03634 0           L/D
1037  REF   3  LAST  173      25,3522  17636 1  STODL    L/D1
1038  REF   6  LAST  626      25,3523  03622 1           VSQUARE

1039                          25,3524  77614 1  BON                  NO LATERAL CONTROL IF PAST TARGET
1040  REF   4  LAST  625      25,3525  03305 1           GONEPAST
1041  REF   1                25,3526  53560 1           L355
1042                          25,3527  43205 1  DMP      DAD          Y= KLAT VSQUARE + LATBIAS
1043  REF   3  LAST  799      25,3530  03632 0           KLAT
1044  REF   1                25,3531  15242 1           LATBIAS      Y INTO PD
1045                          25,3532  51525 1  L350     PDDL ABS     IF ABS(L/D)-L/DCMINR NEG, GO TO L353
1046  REF  12  LAST  627      25,3533  03634 0           L/D
1047                          25,3534  50025 0  DSU      BMN
1048  REF   3  LAST  798      25,3535  03630 1           L/DCMINR
1049  REF   1                25,3536  53545 0           L353
1050                          25,3537  75345 1  DLOAD    SIGN         IF K2ROLL LATANG NEG, GO TO L357
1051  REF   6  LAST  803      25,3540  03676 0           LATANG
1052  REF   3  LAST  799      25,3541  03644 1           K2ROLL
1053                          25,3542  71240 1  BMN      DLOAD
1054  REF   1                25,3543  53624 1           L357
1055                          25,3544  41542 1  SR1      PUSH         Y = Y/2
1056                          25,3545  75345 1  L353     DLOAD    SIGN    IF LATANG SIGN(K2ROLL)-Y POS, SWITCH
1057  REF   7  LAST  627      25,3546  03676 0           LATANG
1058  REF   4  LAST  627      25,3547  03644 1           K2ROLL
1059                          25,3550  77625 0  DSU
1060                          25,3551  71240 1  BMN      DLOAD
1061  REF   2  LAST  827      25,3552  53560 1           L355
1062  REF   5  LAST  827      25,3553  03644 1           K2ROLL
1063                          25,3554  57414 1  BONCLR   DCOMP        IF NOSWITCH =1, K2ROLL= K2ROLL
10631 REF   2  LAST  816      25,3555  03210 1           NOSWITCH
10632 REF   3  LAST  827      25,3556  53560 1           L355
1064  REF   6  LAST  627      25,3557  03644 1  STORE    K2ROLL       K2ROLL = - K2ROLL

1065                          25,3560  56345 0  L355     DLOAD    DDV     ROLLC = ACOS(  (L/D1) / LAD)
1066  REF   4  LAST  827      25,3561  03636 1           L/D1
1067  REF  17  LAST  626      25,3562  03624 1           LAD          MPAC SET TO +-1 IF OVERFLOW***
1068                          25,3563  65542 1  SR1      ACOS
1069                          25,3564  43165 1  SIGN     CLEAR
1070  REF   7  LAST  627      25,3565  03644 1           K2ROLL
10701 REF   3  LAST  827      25,3566  03270 1           NOSWITCH
1071  REF  11  LAST  823      25,3567  03316 0  STORE    ROLLC

1072                          25,3570  77776 1  ENDEXIT  EXIT

1073  REF  31  LAST  689      25,3571  3 4676 1 OVERNOUT CA   BIT13   ENTRYDSP  =92D  B13
1074  REF   7  LAST  798      25,3572  7 0102 0          MASK CHANFLAGS
1075                          25,3573  0 0006 1          EXTEND
1076  REF   1                25,3574  1 3600 0          BZF  NODISKY  OMIT DISPLAY.
```

L REENTRY CONTROL

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```
1077  REF   7  LAST  754   25,3575  3 1263 1            CA    ENTRYVN     ALL ENTRY DISPLAYS ARE DONE HERE.
1078  REF 234  LAST  783   25,3576  0 4555 0            TC    BANKCALL
1079  REF   2  LAST  531   25,3577    20621 0           CADR  REGODSPR    NO ABORT IF DISKY IN USE

1080                        25,3600  0 0004 0 NODISKY    INHINT
1081  REF   4  LAST  510   25,3601  10 067 1            CCS   NEWJOB      PROTECT READACCS GRP 5, IF SIDETRACKED.
1082  REF   3  LAST  510   25,3602  0 5057 0            TC    CHANG1
1083  REF  47  LAST  784   25,3603  0 4574 0 SERVNOUT   TC    POSTJUMP    ( COME HERE FROM P67.3)
1084  REF   5  LAST  759   25,3604    77132 1           CADR  SERVEXIT    AND END AVERAGEG JOB VIA  ENDOFJOB.
```


```
P1085           DISPLAY WHEN V IS LESS THAN VQUIT.

 1086                          25,3605   77776 1  STEEROFF EXIT
 1087   REF   4  LAST  824     25,3606   3 4753 1           CA     EBENTRY      PRECAUTIONARY.
 1088   REF  36  LAST  624     25,3607   54 003 0           TS     EBANK

 1089   REF  12  LAST  615     25,3810   3 4783 1           CA     PRIO16       2 LESS THAN NTRYPRIO.
 1090   REF  27  LAST  776     25,3611   0 5027 1           TC     NOVAC
 1091   REF  25  LAST  787     E8,1861                      EBANK= ACG          ANY EB HERE
 1092   REF   3  LAST  754     25,3812     02511 0          2CADR  P67.1        START UP REMAINDER OF P67
 1092                          25,3613     54066 0
A1093                                                                RTOGO      LAT          LONG
A1094                                                                XXXX.X NM  XXX.XX DEG   XXX.XX DEG

 1095   REF  28  LAST  784     25,3614   0 5261 1           TC     2PHSCHNG     INHINT/RELINT DONE.
 1096                          25,3615     00414 0          OCT    00414        4.41 RESTART FOR P67.1 DISPLAY JOB.
 1097                          25,3816     10035 0          OCT    10035        SERVICER 5.3 RESTART.

 1098   REF   1                25,3617   3 3823 0           CA     P67.2CAD     HEREAFTER, DO LAT, LONG.
 1099   REF  14  LAST  824     25,3620   55=645 0           TS     GOTOADDR

 1100   REF 209  LAST  825     25,3821   0 6006 1           TC     INTPRET
 1101                          25,3622     77650 1          GOTO
 1102   REF   1                25,3623     54530 0  P67.2CAD       P67.2        CONTINUE FOR LAT, LONG THIS TIME.

 1103                          25,3624     75345 1  L357    DLOAD  SIGN         L/D = L/DCMINR SIGN(L/D)
 1104   REF   4  LAST  827     25,3625     03630 1                 L/DCMINR
 1105   REF  13  LAST  827     25,3828     03634 0                 L/D
 1108   REF   5  LAST  827     25,3827     37636 0          STCALL L/D1
 1107   REF   4  LAST  827     25,3830     53560 1                 L355         (GO TO )
```

```
P1108   TABLE USED FOR SUB-ORBITAL REFERENCE TRAJECTORY CONTROL.
1109                25,3631  00474 0  VREFER  DEC    .019288      REFERENCE VELOCITY SCALED V/51532.3946
1110                25,3632  01235 1          DEC    .040809      13 POINTS ARE STORED AS THE INDEPENDENT
1111                25,3633  02337 1          DEC    .076107      VARIABLE AND THEN SIX 13 POINT FUNCTIONS
1112                25,3634  03721 0          DEC    .122156      OF V ARE STORED CONSECUTIVELY
1113                25,3635  05230 0          DEC    .165546
1114                25,3636  06213 1          DEC    .196012
1115                25,3637  10550 0          DEC    .271945
1116                25,3640  11717 0          DEC    .309533
1117                25,3641  13314 0          DEC    .356222
1118                25,3642  14736 0          DEC    .404192
1119                25,3643  16255 1          DEC    .446087
1120                25,3644  16457 0          DEC    .458023
1121                25,3645  25570 1          DEC    .67918       HIGH VELOCITY FOR SAFETY

1122                25,3646  77528 0          DEC    -.010337     DRANGE/DA   SCALED DRDA/(2700/805)
1123                25,3647  77360 1          DEC    -.018550
1124                25,3650  77106 0          DEC    -.028935
1125                25,3651  76516 1          DEC    -.042039
1126                25,3652  76071 0          DEC    -.058974
1127                25,3653  75570 1          DEC    -.070721
1128                25,3654  74861 0          DEC    -.098538
1129                25,3655  74436 0          DEC    -.107462
1130                25,3656  73212 1          DEC    -.147762
1131                25,3657  71640 0          DEC    -.193289
1132                25,3660  54557 1          DEC    -.602557
1133                25,3661  40000 0          DEC    -.99999
1134                25,3662  40000 0          DEC    -.99999

1135                25,3663  77635 1          DEC    -.0478599  B-3  -DRANGE/DRDOT
1136                25,3664  77563 1          DEC    -.0663683  B-3  SCALED((2VS/8 2700) DR/DRDOT)
1137                25,3665  77354 0          DEC    -.1343468  B-3
1138                25,3666  76712 1          DEC    -.2759646  B-3
1139                25,3667  76086 0          DEC    -.4731437  B-3
1140                25,3670  75322 0          DEC    -.6472067  B-3
1141                25,3671  73237 0          DEC    -1.171693  B-3
1142                25,3672  72104 1          DEC    -1.488382  B-3
1143                25,3673  70301 1          DEC    -1.905171  B-3
1144                25,3674  65635 1          DEC    -2.547990  B-3
1145                25,3675  57311 0          DEC    -4.151220  B-3
1146                25,3676  50575 0          DEC    -5.813817  B-3
1147                25,3677  50575 0          DEC    -5.813817  B-3
```

```
P1148
1149                    25,3700   74443 1     DEC     -.0134001   B3  RDOTREF    SCALED (8 RDT/2VS)
1150                    25,3701   74333 1     DEC     -.013947    B3
1151                    25,3702   74433 0     DEC     -.013482    B3
1152                    25,3703   74783 0     DEC     -.011813    B3
1153                    25,3704   75432 0     DEC     -.0095631   B3
1154                    25,3705   75735 1     DEC     -.00808948  B3
1155                    25,3708   78200 1     DEC     -.008828    B3
1156                    25,3707   75735 1     DEC     -.00806946  B3
1157                    25,3710   75140 0     DEC     -.0109791   B3
1158                    25,3711   74075 0     DEC     -.0151498   B3
1159                    25,3712   73312 0     DEC     -.0179817   B3
1160                    25,3713   73732 0     DEC     -.0159081   B3
1161                    25,3714   73732 0     DEC     -.0159081   B3

1162                    25,3715   00015 0     DEC     .0006087        RANGE TO GO SCALED RTOGO/2700
1163                    25,3718   00068 1     DEC     .0032983                8.9
1164                    25,3717   00208 0     DEC     .0081852                22.1
1165                    25,3720   00431 1     DEC     .017148
1166                    25,3721   00712 0     DEC     .027928
1167                    25,3722   01136 1     DEC     .037
1168                    25,3723   02015 1     DEC     .063296
1169                    25,3724   02374 0     DEC     .077889
1170                    25,3725   03123 1     DEC     .098615
1171                    25,3726   04051 1     DEC     .127519
1172                    25,3727   05767 1     DEC     .166963
1173                    25,3730   07476 0     DEC     .236148
1174                    25,3731   11324 1     DEC     .294165165

1175                    25,3732   76272 1     DEC     -.051099        -AREF/805
1176                    25,3733   75472 1     DEC     -.074534
1177                    25,3734   74604 0     DEC     -.101242
1178                    25,3735   74210 1     DEC     -.116646
1179                    25,3736   74052 0     DEC     -.122360
1180                    25,3737   73735 1     DEC     -.127061
1181                    25,3740   73217 1     DEC     -.147453
1182                    25,3741   73013 1     DEC     -.155528
1183                    25,3742   73155 1     DEC     -.149585
1184                    25,3743   74151 1     DEC     -.118509
1185                    25,3744   78703 1     DEC     -.034907
1186                    25,3745   77575 0     DEC     -.007950
1187                    25,3746   77575 0     DEC     -.007950
```

```
P1188
1189                25,3747   00112 0     DEC     .004491     DRANGE/D L/D SCALED Y/2700
1190                25,3750   00204 1     DEC     .008081
1191                25,3751   00407 1     DEC     .016030
1192                25,3752   01113 0     DEC     .035815
1193                25,3753   02161 0     DEC     .069422
1194                25,3754   03260 0     DEC     .104519
1195                25,3755   03717 0     DEC     .122
1196                25,3756   05411 0     DEC     .172407
1197                25,3757   10057 1     DEC     .252852
1198                25,3760   13476 0     DEC     .383148
1199                25,3761   20324 0     DEC     .512963
1200                25,3762   21677 1     DEC     .558519
1201                25,3763   21677 1     DEC     .558519     END OF STORED REFERENCE
```

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P1202 REENTRY CONSTANTS.

R1203 DEFINED BY EQUALS

```
 1204  REF  1                 4721          DEC15     =      LOW4
A1205                                       GAMMAL1   =      22D

 12055                  25,3764   16631 1   MAXRNG    2OCT   16631 06755     DNRNGERR = 9999.9 IF GONEPAST=1
 12055                  25,3765   06755 0

 1206                   26,3144             BANK      26
 1207  REF  2 LAST 805  26,2000             SETLOC    REENTRY1
 1208                   26,3144             BANK

 1209  REF  2 LAST 805 TO 807'    41    41*          COUNT*  $$/ENTRY

 1210  REF  3 LAST 815  27,3362             BARELY1   =      NEARONE         COMMON TO BOTH DISK,DANCE.DEFND IN TPF
A1211                                       1BITDP                 COMMON TO BOTH DISK AND DANCE. DEFND IN VECPOINT.

 1212                   26,3144   02525 1   1/12TH    DEC    .083333         DP 1/12 USES HI WORD IN 1/3 BELOW
 1213                   26,3145   12525 0   1/3RD     2DEC   .3333333333    DP 1/3
 1213                   26,3146   12525 0
 12131 REF  2 LAST 763  27,3356             1/16TH    =      DP2(-4)
```

R1214

R1215 BELOW' VS = VSAT = 25766.1973 FT/SEC

R1216 RE = 21,202,900 FEET

```
 1217                   26,3147   04631 1   LEWD1     2DEC   .15
 1217                   26,3150   23146 0
 1218                   26,3151   03146 1   POINT1    2DEC   .1
 1218                   26,3152   14632 0
 1219                   26,3153   06314 1   POINT2    2DEC   .2              .2
 1219                   26,3154   31463 1
 1220                   26,3155   76314 0   DLEWD0    2DEC   - .05           -.05
 1220                   26,3156   71462 1
 1221                   26,3157   05075 0   GMAX/2    2DEC   .16             8 GS / 2
 1221                   26,3160   16051 1
 1222  REF 23 LAST 763  26,3331             3ZEROS    EQUALS HI6ZEROS
 1223                   26,3161   07777 1   NEAR1/4   2OCT   07777 00000     1/4 LESS 1 BIT IN UPPER PART.
 1223                   26,3162   00000 1
 1224                   26,3163   00236 0   C18       2DEC   .0097026346    500/2VS
 1224                   26,3164   36763 0
 1225                   26,3165   00204 1   Q7FKDMIN  2DEC   .0060745342    6.5/605  (Q7F +KDMIN) = 6 + .5)
 1225                   26,3166   11303 1
 1226  REF  3 LAST 833  27,3356             C1/16     =      DP2(-4)

 1227                   26,3167   05260 0   Q3        2DEC   .167003132     .07 2VS/21600
 1227                   26,3170   05572 1
```

```
1228                26,3171  12343 0  Q5       2DEC    .326386869      .3 23500/21600
1228                26,3172  21616 0
1229                26,3173  01073 1  Q8       2DEC    .0349           2 DEG, APPROX 820/23500
1229                26,3174  31515 1
1230                26,3175  00172 0  Q7P      2DEC    .0074534181     6/605    (VALUE OF Q7 IN FIXED MEM.)
1230                26,3176  03571 1
1231  REF  6 LAST 816 26,3327          Q19      =       HALVE           Q19 = .5
1232                26,3177  00573 0  Q21      2DEC    .0231461461     500/21600
1232                26,3200  10230 1
1233                26,3201  78228 0  Q22      2DEC    -.053333333     -1152/21600
1233                26,3202  45761 0
1234                26,3203  13132 0  VLMIN    2DEC    .34929485       18000/2 VS
1234                26,3204  33062 0
1235  REF  2 LAST 802 26,3321          VMIN     =       FOURTH          (VS/2) / 2VS
1236                26,3205  00180 0  C12      2DEC    .00664572901    32 28500/(21202900 2 PI)
1236                26,3208  05104 1
1237                26,3207  11322 1  1/KB1    2DEC    .29411785       1 / 3.4
1237                26,3210  32265 1
1238                26,3211  75047 0  -1/KB2    2DEC    -.0057074322 B4 = -1/(  .0034  2  VS)  EXP +4
1238                26,3212  72454 1
1239                26,3213  00475 1  VQUIT    2DEC    .019405289      1000 /2VS
1239                26,3214  35748 1
1240                26,3215  08751 1  C20      2DEC    .21739130       (175 FPSS) LIFT UP IF ABOVE C20
1240                26,3216  27515 0
12405               26,3217  05441 0  C21      2DEC    .17391304       140/805
12405               26,3220  14412 0
1241                26,3221  00022 1  25NM     2DEC    .0011574074     25/21800        (25 NAUT MILES)
1241                26,3222  38841 1
1242                26,3223  01003 0  K1D      2DEC    .0314453125     =C18 805/258 = .01 805/258
1242                26,3224  06315 0
1243                26,3225  71435 0  K2D      2DEC    -.201296418     -C17 2VS/258 = -.001 2VS/256
1243                26,3226  75518 1
1244                26,3227  32047 0  KVSCALE  2DEC    .81491944       12800/(2 VS .3048)
1244                26,3230  24387 0
1245                26,3231  37200 1  KASCALE  2DEC    .97657358       5.85 16364/(4 .3048 100 805)
1245                26,3232  05838 1
1246                26,3233  00048 0  KTETA    2DEC*   .383495203 E2 B-14*     1000 2PI/16364(163.84)
1246                26,3234  13137 0
1247                26,3235  00017 1  KT1      2DEC*   .157766327 E 2 B-14*    RE(2PI)/2 VS(16384) 163.64
1247                26,3236  30730 0
1248                26,3237  00040 0  .05G     2DEC    .002            .05/25
1248                26,3240  30447 0
1249                26,3241  00000 1  LATBIAS  2DEC    .00003          APPRX .5 NM/ 4(21600/2 PI)
1249                26,3242  17565 1
1250                26,3243  01727 1  KWE      2DEC    .120056652 B-1
1250                26,3244  20103 1
1251                26,3245  00121 0  KACOS    2DEC    .004973592      1/32(2PI)
1251                26,3246  17460 0
1252                26,3247  00400 0  CHOOK    2DEC    1 B-6           .25/16
1252                26,3250  00000 1
```

```
1253                        26,3251  01252 0  1/24TH   2DEC   .0833333333 B-1
1253                        26,3252  25253 1
1254                        26,3253  24385 1  CH1      2DEC   .32 B1          16 CH1/25 = 16 (1) /25
1254                        26,3254  30244 0
1255                        26,3255  77152 1  KC3      2DEC   -.0247622232    -(4 VS VS/ 2 PI 805 RE)
1255                        26,3256  51354 1
1256                        26,3257  00338 1  VRCONT   2DEC   .0135836888     700/2 VSAT
1256                        26,3260  21810 0
1257  REF  10  LAST  789    26,3327          HALVE    EQUALS HIDPHALF
1258  REF   2  LAST  770    26,3321          FOURTH   EQUALS HIDP1/4

1259  REF   7  LAST  834    26,3327          1/GMAX   EQUALS HALVE          4/GMAX = 4 / 8
1260                        26,3281  00433 0  2HS      2DEC   .0172788811     2 28500 25 32.2/(4 VS VS)
1280                        26,3282  02775 0
1281                        26,3283  00000 1  2HSGMXSQ 2DEC   .0000305717    (2 28500 8 32.2/ 4 VS VS)SQ
1281                        26,3284  20017 0
1282                        26,3285  77785 0  C001     2DEC   -.000825       -(4/25)/258    LEO/D0 CONST
1282                        26,3286  70243 0
1283                        26,3287  31483 1  POINT8   2DEC   .8
1283                        26,3270  08315 0
1284                        26,3271  00541 1  2C1HS    2DEC   .0215983284     2 1.25 28500 805/(2 VS)SQ
1284                        26,3272  33575 0
1285                        26,3273  00148 1  PI1/18   2DEC   .1 B-4
1285                        26,3274  14632 0
1286                        26,3275  00052 0  1/K44    2DEC   .00260929484   2 VS/19749550
1286                        26,3278  30013 0
1287                        26,3277  20411 1  VFINAL   2DEC   .51818016      26800/2 VS
1287                        26,3300  03041 1
1288                        26,3301  20810 1  VFINAL1  2DEC   .523942273     = 27000 / 2 VS
1288                        26,3302  10513 1
1289                        26,3303  11473 1  1/KA1    2DEC   .30048077      25/(1.3 64)
1289                        26,3304  02355 0
1270                        26,3305  00203 0  KA2      2DEC   .008           .2 / 25
1270                        26,3308  02234 0
1271                        26,3307  18237 0  KA3      2DEC   .44720497      = 90  4/805
1271                        26,3310  00148 1
1272                        26,3311  01458 1  KA4      2DEC   .049689441     40/805
1272                        26,3312  03450 0
1273  REF   2  LAST  807    26,3311          QTMIN    =      KA4             = 40/805 = .049689441
1274                        26,3313  58232 1  -HSCALED 2DEC   -.55305018     -28500/2 VS
1274                        26,3314  72332 0
1275                        26,3315  77000 1  -KSCALE  2DEC   -.0312424837   -805/VS
1275                        26,3318  43741 1
1278                        26,3317  36702 1  COS15    2DEC   .965
1276                        26,3320  21727 0
1277  REF   1               26,3144          LATSLOPE EQUALS 1/12TH
R1278       ... END OF RE-ENTRY CONSTANTS ...
```

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```
P0001

0010                        35,3755          BANK  35

0011  REF  1                37,2000          SETLOC BODYATT
0012                        37,3373          BANK

0013  REF  1                                  COUNT 37/CMBAT

A0014                                        PDL 12D - 15D SAFE.

R0015   VALUES OF GIMBAL AND BODY ANGLES VALID AT PIP TIME ARE SAVED DURING  READACCS.

0017  REF  10 LAST 602  E7,1451               EBANK= RTINIT      LET INTERPRETER SET EB

0018  REF 210 LAST 629  37,3373  0 6008 1 CM/POSE TC   INTPRET  COME HERE VIA AVEGEXIT.

0019                    37,3374  77201 1          SETPD VLOAD
0020                    37,3375  00001 0                0
0021  REF  16 LAST 602  37,3376  01177 1                VN
0022                    37,3377  63361 0          VXSC  PDVL     KVSCALE = (12800/ .3048) /2VS
0023  REF  1            37,3400  37872 0                -KVSCALE
0024  REF  10 LAST 789  37,3401  01714 1                UNITW    KVSCALE = .81491944
0025                    37,3402  74235 0          VXV   VXSC     FULL UNIT VECTOR
0026  REF  10 LAST 803  37,3403  01780 1                UNITR    VREL = V - WE*R
0027  REF  1            37,3404  15244 1                KWE
0028                    37,3405  45455 1          VAD   STADR
0029  REF  3  LAST 602  37,3406  74251 1          STORE -VREL    SAVE FOR ENTRY GUIDANCE.  REF COORDS

0030                    37,3407  72056 1          UNIT  LXA,1
0031                    37,3410  00044 1                36D      ABVAL( -VREL) TO X1
0032  REF  6  LAST 804  37,3411  03542 1          STORE UXA/2    -UVREL                   REF COORDS

0033                    37,3412  57435 1          VXV   VCOMP
0034  REF  11 LAST 838  37,3413  01760 1                UNITR    .5 UNIT                  REF COORDS
0035                    37,3414  66256 0          UNIT  SSP      THE FOLLOWING IS TO PROVIDE A STABLE
0036  REF  32 LAST 741  37,3415  00051 0                S1       UN FOR THE END OF THE TERMINAL PHASE.
0037                    37,3416  00476 1 SPVQUIT DEC   .019405  1000/ 2 VS
0038                    37,3417  77300 1          TIX,1 VLOAD    IF V-VQUIT POS, BRANCH.
0039  REF  1            37,3420  77422 0                CM/POSE2
0040  REF  2  LAST 116  37,3421  03534 0                OLDUYA   SAVE UYA IN OLDUYA
0041  REF  3  LAST 772  37,3422  03550 1 CM/POSE2 STORE UYA/2   OTHERWISE CONTINUE TO USE OLDUYA.
                                                                REF COORDS
0042  REF  3  LAST 838  37,3423  03534 0          STORE OLDUYA   RESTORE, OR SAVE AS CASE MAY BE.

0043                    37,3424  57435 1          VXV   VCOMP
0044  REF  7  LAST 838  37,3425  03542 1                UXA/2    FINISH OBTAINING TRAJECTORY TRIAD.
0045                    37,3426  77772 0          VSL1
0046  REF  3  LAST 772  37,3427  03556 1          STORE UZA/2                REF COORDS
```

```
0047                        37,3430  77751 1          TLOAD                PICK UP CDUX, CDUY, CDUZ CORRESPONDING
0048  REF  3  LAST  776     37,3431  03270 1                   ACG/PIP     TO PIPUP TIME IN 2S,C  AND SAVE.
0049                        37,3432  14031 0  CM/TRIO  STODL   24D
0050                        37,3433  00032 0                   25D         AIG/PIP

0051                        37,3434  41434 1          RTB      PUSH        TO PDL0
0052  REF  7  LAST  447     37,3435  45510 1                   CDULOGIC
0053                        37,3436  77746 1          COS
0054  REF  2  LAST  116     37,3437  17564 0          STODL    UBX/2       CI /2
A0055                                                                     AIG/PIP FROM PDL 0
0056                        37,3440  57556 0          SIN      DCOMP
0057  REF  3  LAST  837     37,3441  17570 0          STODL    UBX/2 +4    -SI /2
0058                        37,3442  00033 1                   28D         AMG/PIP
0059                        37,3443  41434 1          RTB      PUSH        TO PDL 0
0060  REF  8  LAST  637     37,3444  45510 1                   CDULOGIC
0061                        37,3445  65356 1          SIN      PDDL        XCH PDL 0. SAVE SM /2
0062                        37,3446  65346 0          COS      PDDL        CM /2 TO PDL 2
0063                        37,3447  00001 0                   0           SM /2
0064                        37,3450  74276 1          DCOMP    VXSC
0065  REF  4  LAST  837     37,3451  03564 0                   UBX/2
0066                        37,3452  77772 0          VSL1                 NOISE WONT OVFL.
0067  REF  2  LAST  116     37,3453  17572 1          STODL    UBY/2       =(-SMCI, NOISE, SMSI) /2
0068                        37,3454  00003 1                   2           CM /2  REPLACES NOISE
0069  REF  3  LAST  837     37,3455  17574 1          STODL    UBY/2 +2    UBY/2=(-SMCI, CM, SMSI)/2
0070                        37,3456  00031 0                   24D         ACG/PIP
0071                        37,3457  41434 1          RTB      PUSH        TO PDL 4
0072  REF  9  LAST  637     37,3460  45510 1                   CDULOGIC
0073                        37,3461  65356 1          SIN      PDDL        XCH PDL 4. SAVE SO /2
0074                        37,3462  74346 0          COS      VXSC        CO /2
0075  REF  4  LAST  837     37,3463  03572 1                   UBY/2
0076  REF  5  LAST  637     37,3464  17572 1          STODL    UBY/2       UBY/2=(-COSMCI, COCM, COSMSI)/4
0077                        37,3465  00005 1                   4D          SO /2
0078                        37,3466  57405 1          DMP      DCOMP
0079  REF  5  LAST  837     37,3467  03570 0                   UBX/2 +4    -SI /2
0080                        37,3470  77615 0          DAD
0081  REF  6  LAST  637     37,3471  03572 1                   UBY/2        INCREMENT BY (SOSI /4)
0062  REF  7  LAST  837     37,3472  17572 1          STODL    UBY/2
A0083                                                                     SO /2 FROM PDL 4
0084                        37,3473  43205 1          DMP      DAD
0085  REF  6  LAST  837     37,3474  03564 0                   UBX/2       CI /2
0088  REF  6  LAST  837     37,3475  03576 0                   UBY/2 +4
0087  REF  9  LAST  837     37,3476  27576 0          STOVL    UBY/2 +4    YB/4                 PLATFORM COORDS

A0088                                                                                 YB = (-COSMCI + SOSI , COCM , COSMSI + SOCI )

0089  REF 10  LAST  837     37,3477  03572 1                   UBY/2
0090                        37,3500  72505 1          VXM      VSL2
0091  REF 33  LAST  790     37,3501  01736 1                   REFSMMAT    .5 UNIT
0092  REF 11  LAST  837     37,3502  17572 1          STODL    UBY/2       YB/2  DONE                REF COORDS
```

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A0093
 0094                                  37,3503   76561 1     VXSC  VSL1          CM /2 FROM PDL 2
 0095  REF   7  LAST  837              37,3504   03564 0           UBX/2
 0096  REF   8  LAST  838              37,3505   17564 0     STODL UBX/2         =( CMCI, NOISE, -CMSI)/2
 0097                                  37,3506   77826 0     STADR               SM /2 FROM PDL 0
 0098  REF   9  LAST  838              37,3507   50211 0     STOVL UBX/2 +2      SM /2 REPLACES NOISE
 0099  REF  10  LAST  838              37,3510   03564 0           UBX/2         XB/2              PLATFORM COORDS

A0100                                                                  XB = ( CMCI , SM , -CMSI )

 0101                                  37,3511   76505 0     VXM   VSL1
 0102  REF  34  LAST  837              37,3512   01736 1           REFSMMAT      .5 UNIT
 0103  REF  11  LAST  838              37,3513   03564 0     STORE UBX/2         XB/2  DONE        REF COORDS

 0104                                  37,3514   76435 1     VXV   VSL1
 0105  REF  12  LAST  837              37,3515   03572 1           UBY/2
 0106  REF   2  LAST  116              37,3516   27600 1     STOVL UBZ/2         ZB/2  DONE        REF COORDS

A0107                                                                  EQUIVALENT TO
A0108                                                                  ZB = ( SOSMCI + COSI , -SOCM , -SOSMSI + COCI)

 0109  REF   8  LAST  836              37,3517   03542 1           UXA/2         -UVREL/2 = -UVA/2
 0110                                  37,3520   53435 0     VXV   UNIT          GET UNIT(-UVREL*UBY)/2  = UL/2
 0111  REF  13  LAST  838              37,3521   03572 1           UBY/2         YB/2
 0112                                  37,3522   50206 0     PUSH  DOT           UL/2  TO PDL 0,5
 0113  REF   4  LAST  836              37,3523   03556 1           UZA/2         UNA/2
 0114  REF   3  LAST  544              37,3524   24021 1     STOVL COSTH         COS(ROLL)/4
 0115                                  37,3525   00001 0           0             UL/2

 0116                                  37,3526   77641 1     DOT
 0117  REF   4  LAST  836              37,3527   03550 1           UYA/2
 0118  REF   3  LAST  544              37,3530   34023 1     STCALL SINTH        -SIN(ROLL)/4
 0119  REF   3  LAST  544              37,3531   47211 0           ARCTRIG
 0120                                  37,3532   24007 0     STOVL 6D            -(ROLL/180) /2
 0121  REF  14  LAST  838              37,3533   03572 1           UBY/2
 0122                                  37,3534   72441 0     DOT   SL1           -UVA.UBY = -SIN(BETA)
 0123  REF   9  LAST  838              37,3535   03542 1           UXA/2         -UVREL/2
 0124                                  37,3536   77736 0     ARCSIN
 0125                                  37,3537   24010 0     STOVL 7D            -(BETA/180) /2
 0126  REF  12  LAST  838              37,3540   03564 0           UBX/2         XB/2
 0127                                  37,3541   77641 1     DOT                 UL.UBX = -SIN(ALFA)
 0128                                  37,3542   00001 0           0             UL/2
 0129  REF   4  LAST  838              37,3543   24023 0     STOVL SINTH         -SIN(ALFA)/4
 0130                                  37,3544   77641 1     DOT                 UL/2 FROM PDL 0
 0131  REF   3  LAST  838              37,3545   03600 1           UBZ/2
 0132  REF   4  LAST  838              37,3546   34021 0     STCALL COSTH        COS(ALFA)/4
 0133  REF   4  LAST  836              37,3547   47211 0           ARCTRIG
 0134                                  37,3550   24011 1     STOVL 8D            -(ALFA/180) /2
 0135  REF  12  LAST  836              37,3551   01760 1           UNITR         UR/2              REF COORDS
 0136                                  37,3552   72441 0     DOT   SL1
```

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```
 0137  REF  5  LAST  838    37,3553   03556 1          UZA/2       MORE ACCURATE AT LARGE ARG.
 0138                       37,3554   77726 1    ARCCOS
 0139                       37,3555   00013 0    STORE  10D       (-GAMA/180)/2

 0140                       37,3556   77551 0    TLOAD  EXIT      ANGLES IN MPAC IN THE ORDER
A0141                                                             -( (ROLL, BETA, ALFA) /180)/2
 0142                       37,3557   00007 0           6D        THESE VALUES CORRECT AT PIPUP TIME.
R0143  SPACER
```

L CM BODY ATTITUDE

P0144 BASIC SUBROUTINE TO UPDATE ATTITUDE ANGLES

```
 0145   REF  26  LAST  629   E6,1861                          EBANK= ACC

 0146   REF   1               37,3580  3 4752 0  CM/ATUP  CA    EBACC
 0147   REF  37  LAST  629    37,3561  54 003 0            TS    EBANK
 0148   REF  17  LAST  737    37,3562  50 120 1  CMTR1     INDEX FIXLOC
 0149                         37,3583  4 0012 0            CS    10D          (GAMA/160)/2
 0150   REF   2  LAST  110    37,3584  57=722 1            XCH   GAMA
 0151   REF  74  LAST  779    37,3585  54 001 1            TS    L

 0152                         37,3586  0 0004 0            INHINT
A0153                                                     MUST REMAIN INHINTED UNTIL UPDATE OF BODY
A0154                                                     ANGLES, SO THAT GAMDIPSW IS VALID FIRST PASS
A0155                                                     INDICATOR.

 0156   REF   8  LAST  827    37,3587  4 0102 0            CS    CM/FLAGS
 0157   REF  23  LAST  732    37,3570  7 4700 0            MASK  BIT11        GAMDIPSW=94D BIT11   INITLY=0
 0158                         37,3571  0 0006 1            EXTEND             DONT CALC GAMA DOT UNTIL HAVE FORMD
A0159                                                                        ONE DIFFERENCE.
 0160   REF   1               37,3572  1 3575 1            BZF   DOGAMDOT     IS OK, GO ON.
 0161   REF   9  LAST  640    37,3573  28 102 0            ADS   CM/FLAGS     KNOW BIT IS 0
 0162   REF   1               37,3574  0 3610 0            TC    NOGAMDOT     SET GAMDOT = 0

 0163   REF  75  LAST  640    37,3575  4 0001 1  DOGAMDOT  CS    L
 0164   REF   3  LAST  640    37,3578  8 1722 1            AD    GAMA         DEL GAMA/380= T GAMDOT/360
 0165                         37,3577  0 0006 1            EXTEND
 0166   REF   1               37,3600  7 3673 1            MP    TCDU         TCDU = .1 SEC,   T = 2 SEC.
 0167   REF   2  LAST  110    37,3601  55=723 1            TS    GAMDOT       GAMA DOT TCDU / 180

 0168                         37,3602  0 0006 1            EXTEND
 0169                         37,3603  6 3605 1            BZMF  +2           IGNORE GAMDOT IF LEQ  .5 DEG/SEC
 0170                         37,3604  4 0000 0            COM
 0171   REF  20  LAST  624    37,3605  8 4715 0            AD    FIVE
 0172                         37,3606  0 0008 1            EXTEND
 0173                         37,3607  8 3612 1            BZMF  +3           SET GAMDOT=+0 AS TAG IF TOO SMALL.

 0174   REF 154  LAST  788    37,3610  3 4714 1  NOGAMDOT  CA    ZERO         COME HERE INHINTED.
 0175   REF   3  LAST  840    37,3611  55=723 1            TS    GAMDOT
A0176                                                     FOR NOW LEAVE IN 2S,C
A0177                                                     UPDATE ANGLES BY CORRECTING EULER ANG
A0178                                                     FOR ACCRUED INCREMENT SINCE PIPUP
A0179                                                     R = R EUIL + R(NOW) -R(PIPUP)
 0180   REF 263  LAST  825    37,3612  4 0154 0            CS    MPAC         GET (R EUL/180) /2
 0181                         37,3613  8 0000 1            DOUBLE             POSSIBLE OVERFLOW
 0182   REF   1               37,3614  0 3883 1            TC    CORANGOV     CORRECT FOR OVFL IF ANY
 0183                         37,3615  0 0008 1            EXTEND
 0184   REF   3  LAST  778    37,3618  81=872 0            SU    ROLL/PIP     GET INCR SINCE PIPUP
 0185   REF   3  LAST  778    37,3617  8 1864 1            AD    ROLL/180     ONLY SINGLE OVFL POSSIBLE.
 0188   REF   2  LAST  840    37,3620  0 3683 1            TC    CORANGOV     CORRECT FOR OVFL IF ANY
```

```
0167  REP  2  LAST  114  37,3621  55=770 1          TS     TEMPROLL

0188  REP 284  LAST  840  37,3622  4 0156 1         CS     MPAC +2      GET (ALPA EUL/180) /2
0189                      37,3623  6 0000 1         DOUBLE              SAME AS FOR ROLL. NEEDED FOR EXT ATM DAP
0190  REP  3  LAST  840  37,3624  0 3663 1         TC     CORANGOV     CORRECT FOR OVFL IF ANY
0191                      37,3625  0 0008 1         EXTEND
0192  REP  2  LAST  109  37,3626  61=673 1         SU     ALPA/PIP
0193  REP  3  LAST  173  37,3627  6 1665 0         AD     ALPA/180
0194  REP  4  LAST  841  37,3630  0 3663 1         TC     CORANGOV     CORRECT FOR OVFL IF ANY
0195  REP  2  LAST  114  37,3631  55=771 0         TS     TEMPALPA

0196  REP 285  LAST  841  37,3632  4 0155 1         CS     MPAC +1      GET (BETA EUL/180) /2
0197                      37,3633  6 0000 1 CMTR2   DOUBLE
0198                      37,3634  0 0008 1         EXTEND
0199  REP  3  LAST  778  37,3635  61=674 0         SU     BETA/PIP
0200  REP  3  LAST  778  37,3636  6 1666 0         AD     BETA/180
0201  REP  2  LAST  114  37,3637  57=772 1         XCH    TEMPBETA     OVFL NOT EXPECTED.

0202  REP  3  LAST  526  37,3640  3 4744 1         CA     EBANK3
0203  REP 38  LAST  840  37,3641  54 003 0         TS     EBANK

0204  REP  1             E3,1446                   EBANK= PHSNAME5
0205                      37,3642  0 0008 1         EXTEND
0206  REP  1             37,3643  3 3675 0         DCA    REPOSADR     THIS ASSUMES THAT THE  TC   PHASCHNG
0207  REP  2  LAST  841  37,3644  53=447 0         DXCH   PHSNAME5     IS NOT CHANGED IN      OCT  10035
A0208                                              SERVICER.

0209  REP  2  LAST  840  37,3645  3 4752 0         CA     EBANK7
0210  REP 39  LAST  841  37,3646  54 003 0         TS     EBANK

0211  REP 27  LAST  840  E6,1861                   EBANK= ACCS
0212                      37,3647  0 0008 1 REDOPOSE EXTEND            RE-STARTS COME HERE
0213  REP  3  LAST  841  37,3650  3 1771 1         DCA    TEMPROLL
0214  REP  4  LAST  840  37,3651  53=665 1         DXCH   ROLL/180
0215  REP  3  LAST  841  37,3652  3 1772 1         CA     TEMPBETA
0216  REP  4  LAST  841  37,3653  55=666 1         TS     BETA/180

0217                      37,3654  0 0003 1         RELINT

0218  REP 211  LAST  836  37,3655  0 8006 1         TC     INTPRET      CANT TC DANZIG AFTER PHASCHNG.
0219                      37,3656   51575 1 CM/POSE3 VLOAD  ABVAL      RETURN FROM CM/ATUP.  (RESTART)
0220  REP 17  LAST  836  37,3657   01177 1         VN                  2(-7)  M/CS
0221  REP  6  LAST  536  37,3660   03723 1         STORE  VMAGI        FOR DISPLAY ON CALL.

0222                      37,3661   77650 1         GOTO
0223  REP  5  LAST  799  37,3662   03324 1                POSEXIT      ENDEXIT, STARTENT, OR SCALEPOP.

0224  REP 76  LAST  840  37,3663  54 001 1 CORANGOV TS     L
0225  REP 176  LAST  788  37,3664  0 0002 0         TC     Q
0226  REP 186  LAST  825  37,3665  50 000 1         INDEX  A
```

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0227  REP   1                    37,3666   3 4673 1            CA      LIMITS
0226  REP  77  LAST  641         37,3667   26 001 1            ADS     L
0229  REP 177  LAST  641         37,3670   0 0002 0            TC      Q          COSTS 2 MCT TO USE. SEE ANGOVCOR.

0230                             37,3671   45730 1  -KVSCALE   2DEC    -.81491944 -12600/(2 VS .3046)
0230                             37,3672   53410 1
0231                             37,3673   03146 1  TCDU       DEC     .1         TCDU = .1 SEC.

0232  REP  28  LAST  641         E6,1661                       EBANK=  ACG
0233  REP   1                    37,3674   03647 1  REPOSADR   2CADR   REDOPOSE
0233  REP   1                    37,3675   76066 0
```

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```
 0001                        31,3215                 BANK   31
 00012  REF  1               36,2000                 SETLOC RTE1
 00014                       36,2502                 BANK

 0002   REF  3  LAST  275    E7,1631                 EBANK= RTEDVD
 0003   REF  1                                       COUNT  31/P37

R0050   PROGRAM DESCRIPTION - P37, RETURN TO EARTH

R0051   DESCRIPTION
R0052     A RETURN TO EARTH TRAJECTORY IS COMPUTED PROVIDED THE CSM IS OUTSIDE THE LUNAR SPHERE OF INFLUENCE AT THE
R0054   TIME OF IGNITION. INITIALLY A CONIC TRAJECTORY IS DETERMINED AND RESULTING IGNITION AND REENTRY PARAMETERS ARE
R0056   DISPLAYED TO THE ASTRONAUT. THEN IF THE ASTRONAUT SO DESIRES, A PRECISION TRAJECTORY IS DETERMINED WITH THE
R0058   RESULTING IGNITION AND REENTRY PARAMETERS DISPLAYED. UPON FINAL ACCEPTANCE BY THE ASTRONAUT, THE PROGRAM
R0060   COMPUTES AND STORES THE TARGET PARAMETERS FOR RETURN TO EARTH FOR USE BYSPS PROGRAM (P40) OR RCS PROGRAM (P41).

R0080   CALLING SEQUENCE
R0081     L      TC     P37

R0100   SUBROUTINES CALLED
R0101     PREC100
R0102       V2T100
R0103       RTENCK2
R0104       RTENCK3
R0105       TIMERAD
R0108       PARAM
R0107     V2T100
R0108       GAMDV10
R0109       XT1LIM
R0110       DVCALC
R0111     RTENCK1
R0112       INTSTALL
R0113       INTEGRVS
R0114     RTEVN
R0115       RTEDISP
R0116       TMRAD100
R0117       AUGEKUGL
R0118       LAT-LONG
R0119     TMRAD100
R0120       TIMERAD
R0121     INVC100
R0122       CSMPREC
R0123     GETERAD
R01235    TIMETHET
R0124     P370ALRM
R0125     VN1645
R0126     POLY

R0150   ERASABLE INITIALIZATION REQUIRED
R0151     CSM STATE VECTOR
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R0152   NJETSFLG      NUMBER OF JETS IF THE RCS PROPULSION SYSTEM SELECTED   STATE FLAG      0=4 JETS  1=2 JETS

R0160   ASTRONAUT INPUT
R0161     SPRTETIG    TIME OF IGNITION (OVERLAYS TIG)                        DP      B28     CS
R0163     VPRED       DESIRED CHANGE IN VELOCITY AT TIG(PROGRM COMPUTED IF 0) DP     B7      METERS/CS
R0165     GAMMAEI     DESIRED FLIGHT PATH ANGLE AT REENTRY (COMPUTED IF 0)   DP      B0      REVS  + ABOVE HORIZ.
R0167     OPTION2     PROPULSION SYSTEM OPTION                               SP      B14     1=SPS, 2=RCS

R0160   OUTPUT
R0181     CONIC OR PRECISION TRAJECTORY DISPLAY
R0182       VPRED     VELOCITY MAGNITUDE AT 400,000 FT. ENTRY ALTITUDE       DP      B7      METERS/CS
R0184       T3TOT4    TRANSIT TIME TO 400,000 FT. ENTRY ALTITUDE             DP      B26     CS
R0186       GAMMAEI   FLIGHT PATH ANGLE AT 400,000 FT. ENTRY ALTITUDE        DP      B0      REVS  + ABOVE HORIZON
R0188       DELVLVC   INITIAL VELOCITY CHANGE VECTOR IN LOCAL VERTICAL COORD. VECTOR  B7     METERS/CS
R0190       LAT(SPL)  LATITUDE OF THE LANDING SITE                           DP      B0      REVS
R0192       LNG(SPL)  LONGITUDE OF THE LANDING SITE                          DP      B0      REVS
R0194     TARGETING COMPUTATION DISPLAY
R0195       TIG       RECOMPUTED TIG BASED ON THRUST OPTION                  DP      B26     CS
R0197       TTOGO     TIME FROM TIG                                          DP      B28     CS
R0199       +MGA      POSITIVE MIDDLE GIMBAL ANGLE                           DP      B0      REVS  -.02 IF REFSMFLG=0
R0201     THRUST PROGRAM COMMUNICATION
R0202       XDELVFLG  EXTERNAL DELTA V FLAG                                  STATE FLAG      SET 0 FOR LAMBERT AIMPT
R0204       NORMSW    LAMBERT AIMPT ROTATION SWITCH                          STATE FLAG      SET 0 FOR NO ROTATION
R0206       ECSTEER   CROSS PRODUCT STEERING CONSTANT                        SP      B2      SET 1
R0208       RTARG     CONICALLY INTEGRATED REENTRY POSITION VECTOR           VECTOR  B29     METERS
R0210       TPASS4    REENTRY TIME                                           DP      B28     CS

0243  REF  87  LAST  815   36,2502  0 5301 0  P37      TC      PHASCHNG     P37 IS NOT RESTARTABLE.
0244                        36,2503   00004 0           OCT     4

0245  REF 212  LAST  841   36,2504  0 8006 1           TC      INTPRET
0246                        36,2505   88170 1           AXT,1   SXA,1
0247                        36,2508   04000 0           OCT     04000
0248  REF   5  LAST  640   36,2507   03424 0                   ECSTEER
0249                        36,2510   77776 1           EXIT
0250  REF   1               36,2511  3 3242 0           CAP     V6N33RTE     INPUT TIG   STORED IN SPRTETIG
0251  REF   1               36,2512  0 3231 1           TCR     P370GOF                  OVERLAYED WITH TIG
0252                        36,2513  1 2511 1           TCF     -2           DISPLAY NEW DATA
0253  REF   1               36,2514  3 3246 1           CAP     V6N60RTE     INPUT REENTRY ANGLE IN GAMMAEI
0254  REF   1               36,2515  0 3205 0           TCR     P37GFRB1       AND DESIRED DELTA V IN RTEDVD
0255                        36,2516  1 2514 1           TCF     -2           DISPLAY NEW DATA
0500  REF 213  LAST  644   36,2517  0 6006 1  RTE299   TC      INTPRET
0501                        36,2520   71331 0           SSP     DLOAD
0502  REF   1               36,2521   00122 0                   OVFIND
05025                       36,2522   00000 1                   0
0503  REF   7  LAST  764   36,2523   03767 1                   VPRED
0504  REF   4  LAST  643   36,2524   17632 0           STODL   RTEDVD
0505  REF   6  LAST  764   36,2525   03771 0                   GAMMAEI
0506  REF   3  LAST  275   36,2526   17634 0           STODL   RTEGAM2D
0509  REF   1               36,2527   31667 1                   1RTEB13
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0510  REF  2  LAST  125   36,2530   17735 0          STODL  CONICX1
0511  REF  1               36,2531   33756 0                 C4RTE
0512  REF  2  LAST  125   36,2532   37652 1          STCALL MAMAX1
0513  REF  1               36,2533   64427 1                 INVC100        GET R(T1)/,V(T1)/,UR1/,UH/
0514                       36,2534   77545 0          DLOAD  EXIT
05145 REF  2  LAST  125   36,2535   03646 0                 R(T1)
0515  REF  2  LAST  286   36,2536   0 7171 1         TC     POLY
0516                       36,2537   00002 0          DEC    2
0517                       36,2540   02544 0          2DEC   181000434.B-31
0517                       36,2541   35436 0
0518                       36,2542   14040 0          2DEC   1.50785145B-2
0518                       36,2543   05066 1
0519                       36,2544   44052 0          2DEC*  -6.49993057E-9B27*
0519                       36,2545   60030 1
0520                       36,2546   26415 0          2DEC*  9.76938926E-18B56*
0520                       36,2547   25057 1
0521  REF 214  LAST  844   36,2550   0 6006 1         TC     INTPRET
0522                       36,2551   77752 1          SL1
0525  REF  2  LAST  125   36,2552   17654 0          STODL  MAMAX2          CO+C1*R+C2*R**2+C3*R**3=MAMAX2 B30
0526  REF  1               36,2553   31717 1                 MPGRTEB26
0527  REF  2  LAST  125   36,2554   17730 0          STODL  NN1A
0528  REF  1               36,2555   33762 1                 K2RTE
0529  REF  2  LAST  125   36,2556   17636 1  RTE320  STODL  RCON            RCON=K2
0530  REF  4  LAST  644   36,2557   03634 0                 RTEGAM2D
0531                       36,2560   44254 1          BZE    BDSU
0532  REF  1               36,2561   74570 0                 RTE340         GOTORTE340 IF REENTRY ANGLE NOT INPUT
0533  REF  1               36,2562   31655 0                 1RTEB2
05335                      36,2563   71406 0          PUSH   COS                                              PL02D
0534                       36,2564   73525 1          PDDL   SIN
0535                       36,2565   45465 1          BDDV   STADR                                            PL00D
0536  REF  1               36,2566   40051 1          STCALL X(T2)           X(T2)=COT(GAM2D)                 B0
0537  REF  1               36,2567   74603 1                 RTE360
0538                       36,2570   45345 1  RTE340  DLOAD  DSU
0539  REF  3  LAST  645   36,2571   03646 0                 R(T1)
0540  REF  1               36,2572   33760 0                 K1RTE
0541                       36,2573   71240 1          BMN    DLOAD
0542  REF  1               36,2574   74600 1                 RTE350
0543  REF  1               36,2575   33766 0                 K4RTE
0544  REF  2  LAST  645   36,2576   37726 0          STCALL X(T2)           X(T2)=K4
0545  REF  2  LAST  645   36,2577   74603 1                 RTE360
0546                       36,2600   77745 1  RTE350  DLOAD
0547  REF  1               36,2601   33764 1                 K3RTE
0548  REF  3  LAST  845   36,2602   03726 1          STORE  X(T2)           X(T2)=K3
0549                       36,2603   77624 1  RTE360  CALL
0550  REF  1               36,2604   65136 0                 V2T100
0551                       36,2605   52054 1          BZE    GOTO
0552  REF  1               36,2606   74610 0                 RTE367
0553  REF  1               36,2607   74772 0                 RTEALRM
0554                       36,2610   77775 1  RTE367  VLOAD
0555  REF  2  LAST  125   36,2611   03640 0                 R(T1)/
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0556   REP   6  LAST  546   36,2612   16657 1            STODL  RVEC
0557   REP   3  LAST  845   36,2613   03636 1                   RCON
0558   REP   2  LAST   94   36,2614   26760 1            STOVL  RDESIRED
0559   REP   2  LAST  125   36,2615   03700 0                   V2(T1)/
0560   REP  10  LAST  548   36,2616   38746 1            STCALL VVEC
0561   REP   1              36,2617   64272 1                   TMRAD100
0562                        36,2620   77615 0            DAD
0563   REP   2  LAST  125   36,2621   03716 1                   T1
0570   REP   2  LAST  125   36,2622   17736 0            STODL  T2
0571   REP   5  LAST  645   36,2623   03634 0                   RTEGAM2D
0572                        36,2624   52054 1            BZE    GOTO
05725  REP   1              36,2625   74627 1                   RTE369
057251 REP   1              36,2626   74651 0                   RTE372
0573                        36,2627   51575 1  RTE369    VLOAD  ABVAL
0574   REP   2  LAST  125   36,2630   03710 1                   V(T2)/
0575                        36,2631   77776 1            EXIT
0576   REP   3  LAST  845   36,2632   0 7171 1           TC     POLY
0577                        36,2633   00002 0            DEC    2
0576                        36,2634   00000 1            2DEC   0
0576                        36,2635   00000 1
0579                        36,2636   47021 1            2DEC   -4.6760771E-2B4
0579                        36,2637   65002 0
0560                        36,2640   35610 0            2DEC   4.5419476E-4B11
0580                        36,2641   07722 1
0581                        36,2642   63772 0            2DEC   -1.4317875E-6B18
0581                        36,2643   63278 1
0582   REP 215  LAST  845   36,2644   0 6008 1           TC     INTPRET
05825                       36,2645   77815 0            DAD
058251 REP   1              36,2646   01352 1                   RTED1
0583                        36,2647   52052 1            SL3    GOTO          X(T2),=D1+D2V2+D3V2**2+D4V2**3
0567   REP   1              36,2650   74653 1                   RTE373
0566                        36,2651   77745 1  RTE372    DLOAD                X(T2),=X(T2)
0589   REP   4  LAST  845   36,2652   03728 1                   X(T2)
05895                       36,2653   41425 1  RTE373    DSU    PUSH          X(T2)ERR                        B0 PL02D
056951 REP   5  LAST  846   36,2654   03726 1                   X(T2)
0590                        36,2655   53575 0            VLOAD  UNIT
0591   REP   2  LAST  125   36,2656   03656 1                   R(T2)/                                         B58
0592   REP  13  LAST  766   36,2657   38152 1            STCALL ALPHAV
0593   REP   3  LAST  766   36,2660   26437 0                   GETERAD
0594                        36,2661   77615 0            DAD
0606   REP   1              36,2662   33772 0                   E3RTE
0607                        36,2663   45206 1            PUSH   DSU           RCON,=(E1/(1+E2BETA11)**.5)+E3 B29 PL04D
0606   REP   4  LAST  846   36,2664   03636 1                   RCON
0809                        36,2665   45246 0            ABS    DSU
0610   REP   1              36,2666   31754 0                   EPC2RTE
0611                        36,2667   52040 1            BMN    GOTO
0612   REP   1              36,2670   74672 1                   RTE374
0613   REP   1              36,2671   74677 1                   RTE375
0614                        36,2672   51545 1  RTE374    DLOAD  ABS
0615                        36,2673   00001 0                   00D
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0617                                36,2674  50025 0                DSU   BMN
0616  REP  1                       36,2675  31756 1                      EPC3RTE
0620  REP  1                       36,2676  74747 0                      P37E
0621                                36,2677  43345 1  RTE375        DLOAD DAD
0622  REP  3  LAST  845            36,2700  03730 0                      NN1A
0623  REP  1                       36,2701  31675 1                      1RTEB28
0624                                36,2702  67240 0                BMN   SLOAD
0625  REP  1                       36,2703  74707 1                      RTE360
0626  REP  1                       36,2704  31735 1                      OCT805
0627                                36,2705  77650 1                GOTO
0628  REP  2  LAST  845            36,2706  74772 0                      RTEALRM     TOO MANY ITERATIONS
0629  REP  4  LAST  847            36,2707  03730 0  RTE380        STORE NN1A
0630                                36,2710  53025 0                DSU   BZE
0631  REP  1                       36,2711  31721 1                      M8RTEB28
0632  REP  1                       36,2712  74730 0                      RTE365
0633                                36,2713  45345 1                DLOAD DSU
0634                                36,2714  00001 0                      00D
0635  REP  2  LAST  125            36,2715  03666 1                      DRCON
0636                                36,2716  65301 0                NORM  PDDL        X(T2)ERR-X(T2)ERR,=Z1          PL06D
0637  REP 35  LAST  789            36,2717  00047 1                      X1
0638  REP  2  LAST  125            36,2720  03670 0                      RPRE,
0639                                36,2721  56225 1                DSU   DDV         X(T2)PRI-X(T2)=Z2              PL04D
0640  REP  6  LAST  646            36,2722  03726 1                      X(T2)
06405                               36,2723  53805 1                DMP   SL*         DX(T2)=X(T2)ERR(Z2/Z1)
0641                                36,2724  00001 0                      00D
06415                               36,2725  20201 0                      0,1
0642                                36,2726  77650 1                GOTO
06425 REP  1                        36,2727  74732 1                      RTE390
0643                                36,2730  77745 1  RTE365        DLOAD             DX(T2)=X(T2)ERR
06435                               36,2731  00001 0                      00D
0644                                36,2732  14021 1  RTE390        STODL 16D         DX(T2)                         PL02D
06445                               36,2733  77626 0                STADR
0645  REP  5  LAST  846            36,2734  60141 0                STODL RCON        RCON=RCON,
06455                               36,2735  77600 1                BOV
064551 REP 3  LAST  845             36,2736  74603 1                      RTE360
0646  REP  3  LAST  647            36,2737  17666 1                STODL DRCON       X(T2)ERR,=X(T2)ERR
06465 REP  7  LAST  647             36,2740  03726 1                      X(T2)
0647  REP  3  LAST  647            36,2741  17670 0                STODL RPRE,       X(T2)PRI=X(T2)
06475                               36,2742  00021 1                      16D
0648                                36,2743  77615 0                DAD
06485 REP  8  LAST  847             36,2744  03726 1                      X(T2)
0649  REP  9  LAST  847            36,2745  37726 0                STCALL X(T2)      X(T2)=X(T2)+DX(T2)
06495 REP  4  LAST  847             36,2746  74603 1                      RTE360      REITERATE
0650                                36,2747  77624 1  P37E          CALL              DISPLAY CONIC SOLUTION
0651  REP  1                       36,2750  74776 1                      RTEVN
0600                                36,2751  41345 0  RTE505        DLOAD DMP
0801  REP  2  LAST  125            36,2752  03720 1                      PCON
0802  REP  2  LAST  125            36,2753  03754 1                      BETA1
0603                                36,2754  53021 1                BDSU  BZE
0804  REP  6  LAST  847            36,2755  03636 1                      RCON
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 0805   REP   1                    36,2756   74784 1                  RTE510
 0806                              36,2757   71240 1          BMN     DLOAD
 0807   REP   2  LAST  848         36,2760   74784 1                  RTE510
 0808   REP   2  LAST  845         36,2761   31655 0                  1RTEB2
 0809                              36,2762   77650 1          GOTO
 0810   REP   1                    36,2763   74766 0                  RTE515          ENTRY NEAR APOGEE
 0811                              36,2764   57545 1  RTE510  DLOAD   DCOMP           ENTRY NEAR PERIGEE
 0812   REP   3  LAST  848         36,2765   31655 0                  1RTEB2
 0813   REP   2  LAST  125         36,2766   37781 0  RTE515  STCALL  PHI2
 0814   REP   1                    36,2767   64515 1                  PREC100         PRECISION TRAJECTORY COMPUTATION
 0815                              36,2770   77654 0  RTE825  BZE
 0818   REP   1                    36,2771   75024 0                  P37G
 0817                              36,2772   77824 1  RTEALRM CALL
 0818   REP   1                    36,2773   64255 1                  P370ALRM
 08185                             36,2774   77778 1          EXIT
 0819   REP   2  LAST  200         36,2775   1 2502 0         TCP     P37             RECYCLE AFTER ALARM DISPLAY
R0824
R0825                                  RETURN TO EARTH DISPLAY SUBROUTINE
 0826                              36,2776   45020 1  RTEVN   STO     CALL
 0829   REP   2  LAST  125         36,2777   03783 0                  VNSTORE
 0830   REP   1                    36,3000   64311 0                  RTEDISP         DISPLAY PREPARATION
 0831                              36,3001   77778 1          EXIT
 0832   REP   1                    36,3002   3 3244 0         CAP     V6N81RTE        LATITUDE,LONGITUDE,BLANK
 0833   REP   1                    36,3003   0 3215 1         TCR     P370GOPR          IN LAT(SPL),LNG(SPL),-
 0834   REP   9  LAST  779         36,3004   3 4710 0         CAP     FOUR
 0835   REP   1                    36,3005   0 3211 0         TCR     37BLANK +1
 0836                              36,3008   1 3013 1         TCP     +5
 0837   REP   3  LAST  848         36,3007   1 2502 0         TCP     P37             RECYCLE
 0841   REP   1                    36,3010   3 3245 1         CAP     V6N39RTE        T21 HRS,MIN,SEC IN T3TOT4
 0844   REP   2  LAST  844         36,3011   0 3231 1         TCR     P370GOP
 0845   REP   4  LAST  848         36,3012   1 2502 0         TCP     P37             RECYCLE
 0847   REP   2  LAST  844         36,3013   3 3248 1         CAP     V6N80RTE        DISPLAY BLANK,V(T2),FPA2
 0848   REP   2  LAST  844         36,3014   0 3205 0         TCR     P37GPR81          IN -,VPRED,GAMMAEI
 0849   REP   5  LAST  848         36,3015   1 2502 0         TCP     P37             RECYCLE
 0856   REP   1                    36,3018   3 3247 0         CAP     V6N81RTE        DISPLAY DELTA V (LV) IN DELVLVC
 0859   REP   3  LAST  848         36,3017   0 3231 1         TCR     P370GOP
 0880   REP   6  LAST  848         36,3020   1 2502 0         TCP     P37             RECYCLE
 08615  REP 216  LAST  848         36,3021   0 6008 1         TCR     INTPRET
 0882                              36,3022    77850 1         GOTO
 0863   REP   3  LAST  848         36,3023   03783 0                  VNSTORE
R0864   PRECISION DISPLAY,TARGETING COMPUTATION AND RTE END PROCESSING
 0885                              36,3024   77824 1  P37G    CALL
 0888   REP   2  LAST  847         36,3025   74778 1                  RTEVN
 0887                              36,3026   77776 1          EXIT
 0868   REP  13  LAST  732         36,3027   3 4716 0 P37N    CAP     SEVEN
 0869   REP   6  LAST  608         36,3030   55=131 1         TS      OPTION1
 0870   REP  97  LAST  824         36,3031   3 4712 1         CAP     ONE
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0871  REF  11  LAST  695   36,3032  55 132 1          TS     OPTION2
0872  REF   1              36,3033   3 3243 1        CAF    V4N06RTE      DISPLAY RCS OR SPS OPTION  SPS ASSUMED
0873  REF   4  LAST  848   36,3034   0 3231 1        TCR    P370GOP
0874                       36,3035   1 3033 0        TCF    -2            RECYCLE
0875  REF 217  LAST  848   36,3036   0 6006 1        TC     INTPRET       PROCEED
0876                       36,3037   67201 0         SETPD  SLOAD
0877                       36,3040   00001 0                00D
0878  REF  12  LAST  849   36,3041   01133 1                OPTION2
0879                       36,3042   53025 0         DSU    BZE
0880  REF   2  LAST  844   36,3043   31687 1                1RTEB13
0881  REF   1              36,3044   75053 0                P37Q
0882                       36,3045   60335 1         SLOAD  NORM          SPS
0883  REF   3  LAST  683   36,3046   00111 0                EMDOT
0884  REF  36  LAST  847   36,3047   00047 1                X1
0885                       36,3050   52125 0         PDDL   GOTO
0886  REF   1              36,3051   31725 0                VCSPS
0887  REF   1              36,3052   75084 1                P37T
0888                       36,3053   43145 0  P37Q   DLOAD  BON          RCS
0889  REF   1              36,3054   31731 0                MDOTRCS
0890  REF   3  LAST  682   36,3055   00700 0                NJETSFLG
0891  REF   1              36,3056   75060 0                P37R
0892                       36,3057   77752 1         SL1
0893                       36,3060   77752 1  P37R   SL1
0894                       36,3061   65301 0         NORM   PDDL
0895  REF  37  LAST  849   36,3062   00047 1                X1
0898  REF   1              36,3063   31727 1                VCRCS
0897                       36,3064   56325 0  P37T   PDDL   DDV          DV/VC                      B7 -B5 = B2 PL02D
0898  REF   2  LAST  125   36,3065   03706 0                DV
0899                       36,3068   77776 1         EXIT
0900  REF   4  LAST  646   36,3067   0 7171 1        TC     POLY
0901                       36,3070   00001 0         DEC    1
0902                       36,3071   00001 0         2DEC   5.88240507E-4B-3
0902                       36,3072   05070 0
0903                       36,3073   17527 1         2DEC   9.79487697E-1B-1
0903                       36,3074   38700 0
0904                       36,3075   47114 0         2DEC   -.386281955B1
0904                       36,3076   70670 1
0905  REF 218  LAST  849   36,3077   0 6006 1        TC     INTPRET
0908                       36,3100   87208 1         PUSH   SLOAD         (1-E)**(-DV/VC)=A                B3 PL04D
0907  REF   8  LAST  683   36,3101   03078 0                WEIGHT/G
0908                       36,3102   56205 0         DMP    DDV           DTB=(M0/MDOT)A       B16+B3-B3=B16 PL00D
0909                       36,3103   41257 1         SL*    DMP
0910                       36,3104   20185 1                0 -12D,1
0911  REF   1              36,3105   31733 1                CSUBT
0912                       36,3106   77621 1         BDSU
0913  REF   3  LAST  848   36,3107   03718 1                T1
0914  REF  65  LAST  677   36,3110   03413 1         STORE  TIG           TIG=T1-CT*DTB                    B28
0915                       36,3111   77776 1         EXIT
0916  REF   2  LAST  844   36,3112   3 3242 0        CAF    V6N33RTE      DISPLAY BIASED TIG
0917  REF   5  LAST  849   36,3113   0 3231 1        TCR    P370GOP
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0918
09184  BBF  155  LAST  840
09185  BBF   10  LAST  763
09186  BBF    7  LAST  763
0919   BBF  219  LAST  849
09195
091951 BBF    1
0920
092001 BBF    3  LAST  848
092005
09201  BBF    2  LAST  125
092015 BBF    1
09202
092025 BBF    1
09203  BBF    1
092035
09204
092045 BBF    1
09205  BBF    1
092055
09206  BBF    2  LAST  850
092065 BBF    4  LAST  850
09207
092075 BBF    1
09208  BBF    1
092085
09209  BBF    1
092095
0921   BBF    1
092105
09211  BBF    7  LAST  544
092115
09212  BBF    4  LAST  543
092125 BBF    7  LAST  544
09213  BBF    3  LAST  845
092135 BBF    7  LAST  646
09214  BBF    3  LAST  846
092145 BBF   11  LAST  846
09215  BBF    5  LAST  544
0922
0923   BBF    8  LAST  666
0924   BBF    6  LAST  679
0925
0926   BBF    7  LAST  520
0927
0928   BBF   10  LAST  545
0929   BBF    6  LAST  544
0933
0934   BBF    4  LAST  849
0936   BBF   12  LAST  666
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```
36,3114  1 3112 1
36,3115  3 4714 1
36,3116  55=125 1
36,3117  55=126 1
36,3120  0 6006 1
36,3121  77624 1
36,3122  65055 1
36,3123  53575 0
36,3124  03656 1
36,3125  74315 0
36,3126  03740 1
36,3127  31740 0
36,3130  74315 0
36,3131  03746 1
36,3132  31742 1
36,3133  50255 0
36,3134  50015 0
36,3135  31744 1
36,3136  75163 1
36,3137  50375 0
36,3140  03746 1
36,3141  03656 1
36,3142  71240 1
36,3143  75147 1
36,3144  31746 0
36,3145  52006 0
36,3146  75151 0
36,3147  41545 0  P37U
36,3150  31750 1
36,3151  77756 0  P37V
36,3152  16732 0
36,3153  43146 0
36,3154  03666 1
36,3155  26734 0
36,3156  03640 0
36,3157  26657 1
36,3160  03700 0
36,3161  36746 1
36,3162  24737 1
36,3163  43014 0  P37W
36,3164  01267 0
36,3165  03665 1
36,3166  77214 0
36,3167  01071 0
36,3170  77626 0
36,3171  60362 0
36,3172  00037 0
36,3173  77615 0
36,3174  03716 1
36,3175  27656 1
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```
        TCF   -2
        CAP   ZERO
        TS    VHFCNT
        TS    TRKMKCNT
        TC    INTPRET
        CALL
              RTENCK1
        VLOAD UNIT
              R(T2)/
        PDVL  VXSC
              UR1/
              MCOS7.5
        PDVL  VXSC
              UH/
              MSIN7.5
        VAD   DOT
        DAD   BMN
              MCOS22.5
              P37W
        VLOAD DOT
              UH/
              R(T2)/
        BMN   DLOAD
              P37U
              THETA165
        PUSH  GOTO
              P37V
P37U    DLOAD PUSH
              THETA210
P37V    SIN
        STODL SNTH
        COS   CLEAR
              RVSW
        STOVL CSTH
              R(T1)/
        STOVL RVEC
              V2(T1)/
        STCALL VVEC
              TIMETHET
CLEAR   CLEAR CLEAR
              XDELVFLG
              NORMSW
SET     VLOAD VLOAD
              PINALFLG
        STADR
        STODL RTARG
              T
        DAD
              T1
        STOVL TPASS4
```

CONICALLY INTEGRATE FROM R_1,V_1 OVER T_{12}

	PL00D
UR2	B_1 PL06D
$-UR_1(COS7.5)$	B_1 PL12D
$K/=-UR_1(COS7.5)-UH(SIN7.5)$	B_2 PL00D

K/ . UR2 GR $COS_{22.5}$

```
 0937   REF   4  LAST  850    36,3176   03700 0                    V2(T1)/
 0938                        36,3177   77651 0          VSU
 0939   REF   2  LAST  125    36,3200   03672 1                    V(T1)/
 0940   REF  11  LAST  667    36,3201   37646 1          STCALL    DELVSIN
 0941   REF   5  LAST  520    36,3202   73005 0                    VN1645
 0942                        36,3203   77650 1          GOTO
 0943   REF   2  LAST  850    36,3204   75163 1                    P37W
R0946
R0949   SUBROUTINE TO GO TO GOFLASHR AND BLANK R1

 0950                        36,3205   0 0006 1  P37GPRB1 EXTEND
 0951   REF   2  LAST  125    36,3206   23=762 0           QXCH     SPRTEX
 0952   REF   2  LAST  848    36,3207   0 3215 1           TCR      P370GOFR
 0953   REF  96  LAST  848    36,3210   3 4712 1  37BLANK  CAF      ONE
 0954   REF  15  LAST  727    36,3211   0 5415 1           TCR      BLANKET
 0955   REF 101  LAST  785    36,3212   1 5112 1           TCF      ENDOFJOB
 0956   REF   3  LAST  851    36,3213   0 1762 0           TC       SPRTEX      RECYCLE
 0957   REF   1                36,3214   1 3240 0           TCF      P37PROC     PROCEED
R0958
R0959   SUBROUTINE TO GO TO GOFLASHR

 0960                        36,3215   0 0006 1  P370GOFR EXTEND
 0961   REF   2  LAST  125    36,3216   23=733 1           QXCH     RTNCKEX
 0962   REF 235  LAST  828    36,3217   0 4555 0           TCR      BANKCALL
 0963   REF  19  LAST  752    36,3220    20763 1           CADR     GOFLASHR
 0964   REF  67  LAST  755    36,3221   1 4106 0           TCF      GOTOPOOH    TERMINATE
 0965                        36,3222.  1 3225 0           TCF      +3
 0966                        36,3223   1 3227 1           TCF      +4
 0967   REF   3  LAST  851    36,3224   0 1733 1           TC       RTNCKEX     IMMEDIATE RETURN
 0968   REF   4  LAST  851    36,3225   51=733 1           INDEX    RTNCKEX     PROCEED
 0969                        36,3226   1 0004 1           TCF      0 +4
 0970   REF   5  LAST  851    36,3227   51=733 1           INDEX    RTNCKEX     RECYCLE
 0971                        36,3230   1 0003 0           TCF      0 +3
R0973
R0974   SUBROUTINE TO GO TO GOFLASH

 0975                        36,3231   0 0006 1  P370GOF  EXTEND
 0976   REF   4  LAST  851    36,3232   23=762 0           QXCH     SPRTEX
 0977   REF 236  LAST  851    36,3233   0 4555 0           TCR      BANKCALL
 0978   REF  41  LAST  754    36,3234    20624 0           CADR     GOFLASH
 0979   REF  68  LAST  851    36,3235   1 4106 0           TCF      GOTOPOOH
 0980                        36,3236   1 3240 0           TCF      +2
 0981   REF   5  LAST  851    36,3237   0 1762 0           TC       SPRTEX
 0982   REF   6  LAST  851    36,3240   51=762 0  P37PROC  INDEX    SPRTEX
 0983                        36,3241   1 0001 1           TCF      0 +1
 0985                        36,3242    01441 1  V6N33RTE VN       0633
 0986                        36,3243    01006 0  V4N06RTE VN       0406
 0987                        36,3244    01475 0  V6N61RTE VN       0661
 0988                        36,3245    01447 1  V6N39RTE VN       0639
 0989                        36,3246    01474 1  V6N60RTE VN       0660
```

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```
0990
0996                    36,3247   01521 0  V6N81RTB  VN      0681
0997  REF  1            32,2255                     BANK    32
0996                    32,2000                     SETLOC  RTB
0999  REF  1            32,2255                     BANK
                                                    COUNT   32/RTB
```

```
P1000   ALARM DISPLAY SUBROUTINE
 1050                          32,2255   77420 1  P37OALRM STQ     EXIT
 1051   REP    7  LAST  851    32,2256   03762 1                   SPRTEX
 1055   REP  286  LAST  841    32,2257   3 0154 1          CA      MPAC
 1056   REP    2  LAST  154    32,2260   0 5651 0          TC      VARALARM
 1057   REP    1                32,2261   3 2271 1          CAF     V5N09RTE
 1058   REP  237  LAST  851    32,2262   0 4555 0          TC      BANKCALL
 1059   REP   42  LAST  651    32,2263    20624 0          CADR    GOFLASH
 1060   REP   69  LAST  851    32,2264   1 4106 0          TCF     GOTOPOOH
 1061                          32,2265   1 2261 1          TCF     -4
 1062   REP  220  LAST  850    32,2266   0 6006 1          TC      INTPRET
 1063                          32,2267   77650 1           GOTO
 1064   REP    8  LAST  653    32,2270   03762 1                   SPRTEX
 1065                          32,2271   01211 1  V5N09RTE VN      0509
```

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P2000 TIME RADIUS CALLING SUBROUTINE

R2001 INPUT
R2002 RVEC. INITIAL POSITION VECTOR VECTOR B29 METERS
R2004 VVEC INITIAL VELOCITY VECTOR VECTOR B7 METERS/CS
R2006 RDESIRED FINAL RADIUS FOR WHICH TRANSFER TIME IS TO BE COMPUTED DP B29 METERS
R2008 CONICX1 X1 SETTING FOR CONIC SUBROUTINES -2 = EARTH SP B14
R2010 OUTPUT
R2011 R(T2)/ FINAL POSITION VECTOR VECTOR B29 METERS
R2013 V(T2)/ FINAL VELOCITY VECTOR VECTOR B7 METERS/CS
R2015 T12 TRANSFER TIME TO FINAL RADIUS DP B28 CS

```
2100                                32,2272  43020 1  TMRAD100 STQ     CLEAR
2101  REF  6  LAST  851            32,2273  03733 0                   RTENCXEX
2102  REF  5  LAST  850            32,2274  03666 1                   RVSW
2103                                32,2275  67164 0           AXC,2   SXA,2
2104                                32,2276  20000 0           OCT     20000
2105  REF  2  LAST   94             32,2277  02756 1                   SGNRDOT
2106                                32,2300  45140 0           LXC,1   CALL
2107  REF  3  LAST  845            32,2301  03734 1                   CONICX1
2108  REF  1                        32,2302  25552 1                   TIMERAD
2109  REF  3  LAST  846            32,2303  27710 1           STOVL   V(T2)/                    PL00D
2110                                32,2304  77626 0           STADR
2111  REF  5  LAST  850            32,2305  60121 0           STODL   R(T2)/
2112  REF  7  LAST  850            32,2306  00037 0                   T
2113  REF  3  LAST  126            32,2307  37724 1           STCALL  T12
2114  REF  7  LAST  854            32,2310  03733 0                   RTENCXEX
```

```
P2200   DISPLAY CALCULATION SUBROUTINE

R2201   DESCRIPTION
R2202     OUTPUT FOR DISPLAY IS CONVERTED TO PROPER UNITS AND PLACED IN OUTPUT STORAGE REGISTERS. LANDING SITE
R2204   COMPUTATION FOR DETERMINING LANDING SITE LATITUDE AND LONGITUDE IS INCLUDED IN THE ROUTINE.

R2206   CALLING SEQUENCE
R2207     L       CALL
R2208     L+1             RTEDISP

R2209   SUBROUTINES CALLED
R2210     TMRAD100
R2211     AUGEKUGL
R2212     LAT-LONG

R2213   ERASABLE INITIALIZATION REQUIRED
R2214     PUSHLIST
R2215       NONE
R2216     MPAC
R2217       NONE
R2218     OTHER
R2219       R(T2)/      FINAL POSITION VECTOR                                   VECTOR  B29     METERS
R2221       V(T2)/      FINAL VELOCITY VECTOR                                   VECTOR  B7      METERS/CS
R2223       T2          FINAL TIME                                              DP      B28     CS
R2225       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR                    VECTOR  B7      METERS/CS
R2227       V(T1)/      INITIAL VELOCITY VECTOR                                 VECTOR  B7      METERS/CS
R2229       UR1/        UNIT INITIAL VECTOR                                     VECTOR  B1
R2231       UH/         UNIT HORIZONTAL VECTOR                                  VECTOR  B1

R2233   OUTPUT
R2234     VPRED         VELOCITY MAGNITUDE AT 400,000 FT. ENTRY ALTITUDE        DP      B7      METERS/CS
R2236     T3TOT4        TRANSIT TIME TO 400,000 FT. ENTRY ALTITUDE              DP      B28     CS
R2238     GAMMAEI       FLIGHT PATH ANGLE AT 400,000 FT. ENTRY ALTITUDE         DP      B0      REVS  + ABOVE HORIZ
R2240     DELVLVC       INITIAL VELOCITY CHANGE VECTOR IN LOCAL VERTICAL COORD. VECTOR  B7      METERS/CS
R2242     LAT(SPL)      LATITUDE OF THE LANDING SITE                            DP      B0      REVS
R2244     LNG(SPL)      LONGITUDE OF THE LANDING SITE                           DP      B0      REVS

 2275                             32,2311  77220 1  RTEDISP  STQ     VLOAD           DISPLAY
 2276  REF  9  LAST  853          32,2312  03762 1           SPRTEX
 2277  REF  4  LAST  654          32,2313  03710 1           V(T2)/
 2278                             32,2314  65256 0           UNIT    PDDL
 2279                             32,2315  00045 0           36D
 2280  REF  8  LAST  844          32,2316  17767 1           STODL   VPRED           V(T2)
 2281  REF  3  LAST  646          32,2317  03736 0           T2
 2282                             32,2320  77625 0           DSU
 2283  REF  1                     32,2321  03413 1           SPRTETIG
 2284  REF  2  LAST  267          32,2322  26641 0           STOVL   T3TOT4          T21
 2285  REF  6  LAST  854          32,2323  03656 1           R(T2)/
 2286                             32,2324  50256 0           UNIT    DOT
22865                             32,2325  77752 1           SL1
```

```
2287
2286  REP  4  LAST  648     32,2326  44326 0     ARCCOS BDSU
                            32,2327  31855 0           1RTEE2
2289  REP  7  LAST  844     32,2330  27771 0     STOVL  GAMMAEI        PLIGHT PATH ANGLE T2
2290  REP  5  LAST  851     32,2331  03700 0           V2(T1)/
2291                        32,2332  41451 1     VSU    PUSH
2292  REP  3  LAST  851     32,2333  03672 1           V(T1)/
2293                        32,2334  57441 1     DOT    DCOMP
2294  REP  3  LAST  850     32,2335  03740 1           UR1/
2295                        32,2338  41515 0     PDVL   PUSH
2298                        32,2337  63345 0     DLOAD  PDVL
2297  REP  1                32,2340  31877 0           ZERORTE
2298                        32,2341  55441 0     DOT    VDEP
2299  REP  3  LAST  850     32,2342  03748 1           UH/
22995                       32,2343  77772 0     VSL1
2300  REP 10  LAST  485     32,2344  27405 0     STOVL  DELVLVC        DV/ (LVC)
2301  REP  7  LAST  855     32,2345  03658 1           R(T2)/
2302  REP  8  LAST  650     32,2348  02857 1     STORE  RVEC           ***** LANDING SITE COMPUTATION *****
2303                        32,2347  45248 0     ABVAL  DSU
2304  REP  1                32,2350  31723 0           30480RTE
2305  REP  3  LAST  848     32,2351  26780 1     STOVL  RDESIRED
2306  REP  5  LAST  855     32,2352  03710 1           V(T2)/
2307  REP 12  LAST  850     32,2353  36746 1     STCALL VVEC
2306  REP  2  LAST  846     32,2354  64272 1           TMRAD100          R3,V3,T23 FROM TIMERAD
2309                        32,2355  53575 0     VLOAD  UNIT
2310  REP  8  LAST  856     32,2356  03658 1           R(T2)/
2311                        32,2357  53515 0     PDVL   UNIT           UR3                          PL06D
2312  REP  6  LAST  656     32,2360  03710 1           V(T2)/
2313                        32,2361  72441 0     DOT    SL1            GAMMAE=ARCSIN(UR3 . UV3)     PL00D
2314                        32,2362  65338 1     ARCSIN PDDL           V(T3)                        PL02D
2315                        32,2363  00045 0           36D
2316                        32,2364  51525 1     PDDL   ABS
2317                        32,2365  45006 0     PUSH   CALL           /GAMMAE/                     PL04D
2318  REP  2  LAST  634     32,2366  84075 1           AUGEKUGL          PHIE                         PL06D
2319                        32,2367  43215 0     DAD    DAD
2320  REP  4  LAST  854     32,2370  03724 0           T12               T23
2321  REP  4  LAST  655     32,2371  03738 0           T2
2322                        32,2372  14003 1     STODL  02D            T(LS)=T2+T23+TE
2323                        32,2373  00005 1           04D
2324                        32,2374  77756 0     SIN
2325  REP  3  LAST  275     32,2375  17403 0     STODL  LNG(SPL)       LNG(SPL)=SIN(PHIE)           PL04D
2328                        32,2378  77746 1     COS
2327  REP  9  LAST  799     32,2377  03401 1     STORE  LAT(SPL)       LAT(SPL)=COS(PHIE)
2328                        32,2400  53575 0     VLOAD  UNIT
2329  REP  9  LAST  858     32,2401  03656 1           R(T2)/
2330                        32,2402  41408 0     PUSH   PUSH
2331                        32,2403  53515 0     PDVL   UNIT                                        PL22D
2332  REP  7  LAST  856     32,2404  03710 1           V(T2)/
2333                        32,2405  47315 0     PDVL   VXV
2334                        32,2406  53435 0     VXV    UNIT           UH3=UNIT(UR3 X UV3 X UR3)    PL10D
2335                        32,2407  63381 0     VXSC   PDVL
```

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```
2336  REF   4 LAST  856   32,2410   03403 0          LNG(SPL)
2337                      32,2411   53361 0   VXSC   VAD                                  PL04D
2338  REF  10 LAST  856   32,2412   03401 1          LAT(SPL)
2340                      32,2413   43014 0   CLEAR  CLEAR      T(LS) IN MPAC
2341  REF  11 LAST  799   32,2414   00662 0          ERADFLAG
2342  REF  20 LAST  799   32,2415   01663 0          LUNAFLAG
23425 REF  14 LAST  846   32,2416   16152 0   STODL  ALPHAV     ALPHAV=UR3(COSPHIE)+UH3(SINPHIE)   PL02D
2343                      32,2417   77624 1   CALL
2344  REF   6 LAST  756   32,2420   26322 0          LAT-LONG
2345                      32,2421   77745 1   DLOAD
2346  REF  12 LAST  799   32,2422   01104 0          LAT
2347  REF  11 LAST  857   32,2423   17401 1   STODL  LAT(SPL)   LATITUDE LANDING SITE  *****
2348  REF   7 LAST  601   32,2424   01106 1          LONG
2349  REF   5 LAST  857   32,2425   37403 1   STCALL LNG(SPL)   LONGITUDE LANDING SITE  *****
2350  REF  10 LAST  855   32,2426   03762 1          SPRTEX
2400  REF   2 LAST  852 TO  857'    106   106*  COUNT* $$/RTE
```

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P2500 INITIAL VECTOR SUBROUTINE

R2501 DESCRIPTION
R2502 A PRECISION INTEGRATION OF THE STATE VECTOR TO THE TIME OF IGNITION ISPERFORMED.PRECOMPUTATIONS OCCUR.

R2504 CALLING SEQUENCE
R2505 L CALL
R2506 L+1 $INVC_{100}$

R2507 NORMAL EXIT MODE
R2508 AT L+2 OF CALLING SEQUENCE WITH MPAC = 0

R2509 ALARM EXIT MODE
R2510 AT L+2 OF CALLING SEQUENCE WITH MPAC = OCTAL 612 FOR STATE VECTOR IN MOONS SPHERE OF INFLUENCE

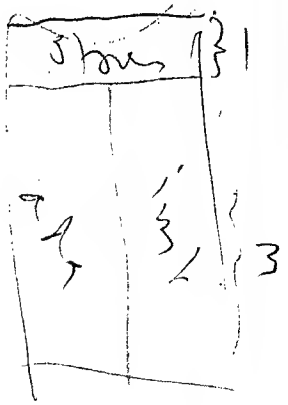
R2512 SUBROUTINES CALLED
R2513 CSMPREC

R2514 ERASABLE INITIALIZATION REQUIRED
R2515 PUSHLIST
R2516 NONE
R2517 MPAC
R2518 NONE
R2519 OTHER
R2520 SPRTETIG TIME OF IGNITION DP B_{28} CS
R2522 CSM STATE VECTOR

R2523 OUTPUT
R2524 $R(T_1)$/ INITIAL POSITION VECTOR AT TIG VECTOR B_{29} METERS
R2526 $V(T_1)$/ INITIAL VELOCITY VECTOR AT TIG VECTOR B_7 METERS/CS
R2528 T_1 INITIAL VECTOR TIME (TIG) DP B_{28} CS
R2530 UR_1/ UNIT INITIAL VECTOR VECTOR B_1
R2532 UH/ UNIT HORIZONTAL VECTOR VECTOR B_1
R2534 CPPA COSINE OF INITIAL FLIGHT PATH ANGLE DP B_1

```
2600                          32,2427  71220 1  INVC100  STQ     DLOAD
2601  REP  11  LAST  857     32,2430  03762 1           STORE   SPRTEX
2602  REP   2  LAST  855     32,2431  03413 1           STORE   SPRTETIG
2603  REP  44  LAST  734     32,2432  34041 0           STCALL  TDEC1
2604  REP   6  LAST  698     32,2433  27022 1           CSMPREC         PRECISION INTEGRATION  R0,V0 TO R1,V1
2605                          32,2434  67175 0           VLOAD   SXA,2
2606  REP  33  LAST  734     32,2435  00001 0           RATT
2607  REP   2  LAST  125     32,2436  03755 0           P(T1)
2608  REP   4  LAST  850     32,2437  27640 0           STOVL   R(T1)/
2609  REP  22  LAST  734     32,2440  00007 0           VATT
2610  REP   4  LAST  856     32,2441  17672 1           STODL   V(T1)/
2611  REP   7  LAST  503     32,2442  00015 0           TAT
2612  REP   5  LAST  850     32,2443  03716 1           STORE   T1
2613                          32,2444  53135 0           SLOAD   BZE
2614  REP   3  LAST  858     32,2445  03756 0           P(T1)
```

```
2615  REP  1                 32,2446  64452 0                 INVC109
2624                         32,2447  52135 1  INVC107  SLOAD  GOTO
2625  REP  1                 32,2450  31736 1                 OCT812
2626  REP  3  LAST  847      32,2451  74772 0                 RTBALRM     R1,V1 NOT IN PROPER SPHERE OF INFLUENCE
2650                         32,2452  53575 0  INVC109  VLOAD  UNIT
2651  REP  5  LAST  658      32,2453  03640 0                 R(T1)/
2652  REP  4  LAST  856      32,2454  17740 1          STODL  UR1/        UR1/                          B1
2653                         32,2455  00045 0                 36D
2654  REP  4  LAST  845      32,2456  27646 0          STOVL  R(T1)       R(T1)                         B29
2655  REP  5  LAST  858      32,2457  03672 1                 V(T1)/
2656                         32,2460  77656 1          UNIT
2657  REP  3  LAST  126      32,2461  03746 1          STORE  UV1/
2658                         32,2462  72441 0          DOT    SL1
2659  REP  5  LAST  859      32,2463  03740 1                 UR1/
2660  REP  2  LAST  125      32,2464  03757 1          STORE  CPPA        CPPA                          B1
2661                         32,2465  45246 0          ABS    DSU
2662  REP  1                 32,2466  31752 0                 EPC1RTE
2663                         32,2467  71240 1          BMN    DLOAD
2664  REP  1                 32,2470  64477 1                 INVC115     NOT NEAR RECTILINEAR
2665  REP  5  LAST  856      32,2471  31655 0                 1RTEB2
2666                         32,2472  41525 0          PDDL   PUSH
2666  REP  2  LAST  856      32,2473  31677 0                 ZERORTE
2669                         32,2474  41466 0          VDEF   PUSH        N/ = (0,0,1)
2670                         32,2475  77650 1          GOTO
2671  REP  1                 32,2476  64503 0                 INVC120
2672                         32,2477  47375 0  INVC115  VLOAD  VXV
2673  REP  6  LAST  859      32,2500  03740 1                 UR1/
2674  REP  4  LAST  859      32,2501  03746 1                 UV1/
2675                         32,2502  77606 1          PUSH               N/ = UR X UV                  B2
2676                         32,2503  41545 0  INVC120  DLOAD  PUSH
2677                         32,2504  77244 0          BPL    VLOAD
2676  REP  1                 32,2505  64507 1                 INVC125
2663                         32,2506  41476 1          VCOMP  PUSH        CORRECT N/ FOR RETROGRADE TRAJECTORY
2664                         32,2507  77775 1  INVC125  VLOAD
2685                         32,2510  53435 0          VXV    UNIT
2686  REP  7  LAST  859      32,2511  03740 1                 UR1/
2667  REP  4  LAST  856      32,2512  03746 1          STORE  UH/         UH/                           B1
2688                         32,2513  77650 1          GOTO
2669  REP 12  LAST  856      32,2514  03762 1                 SPRTEX
```



	add	2-ins	1-ins	stor
46_8	17	12	5	5
38_{10}				

	add	inst	store
38	17	17	5
			5

extra 17

```
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P3000   PRECISION TRAJECTORY COMPUTATION SUBROUTINE

R3001   DESCRIPTION
R3002     A NUMERICALLY INTEGRATED TRAJECTORY IS GENERATED WHICH FOR THE RETURN TO EARTH PROBLEM SATISFIES THE REENTRY
R3004   CONSTRAINTS (RCON AND X(T2)) ACHIEVED BY THE INITIAL CONIC TRAJECTORY AND MEETS THE DVD REQUIREMENT AS CLOSELY
R3006   AS POSSIBLE.
R3007
R3010   CALLING SEQUENCE
R3011     L       CALL
R3012     L+1             PREC100

R3013   NORMAL EXIT MODE
R3014     AT L+2 OF CALLING SEQUENCE WITH MPAC = 0

R3015   ALARM EXIT MODE
R3018     AT L+2 OF CALLING SEQUENCE WITH MPAC =
R3017          OCTAL 805        FOR EXCESS ITERATIONS
R3018          OCTAL 613        FOR REENTRY ANGLE OUT OF LIMITS

R3019   SUBROUTINES CALLED
R3020     INTSTALL
R3021     RTENCK2
R30215    RTENCK3
R3022     TIMERAD
R3023     PARAM
R3024     V2T100

R3025   ERASABLE INITIALIZATION REQUIRED
R3026     PUSHLIST
R3027       NONE
R3028     MPAC
R3029       NONE
R3030     OTHER
R3031       R(T1)/      INITIAL POSITION VECTOR                  VECTOR  B29/B27  METERS
R3033       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR     VECTOR  B7/B5    METERS/CS
R3035       V(T1)/      INITIAL VELOCITY VECTOR                  VECTOR  B7/B5    METERS/CS
R3039       T1          INITIAL VECTOR TIME                      DP      B28      CS
R3041       T12         INITIAL TO FINAL POSITION TIME           DP      B28      CS
R3045       RCON        CONIC FINAL RADIUS                       DP      B29/B27  METERS
R3047       R(T1)       MAGNITUDE OF INITIAL POSITION VECTOR     DP      B29/B27  METERS
R3049       X(T2)       COTANGENT OF FINAL FLIGHT PATH ANGLE     DP      B0
R3051       X(T1)       COTANGENT OF INITIAL FLIGHT PATH ANGLE   DP      B5
R3057       RTEDVD      DELTA VELOCITY DESIRED                   DP      B7/B5    METERS/CS
R3059       MAMAX1      MAJOR AXIS LIMIT FOR LOWER BOUND ON GAMDV ITERATOR  DP  B30/B28  METERS
R3081       MAMAX2      MAJOR AXIS LIMIT FOR UPPER BOUND ON GAMDV ITERATOR  DP  B30/B28  METERS
R3063       UR1/        UNIT INITIAL VECTOR                      VECTOR  B1
R3065       UH/         UNIT HORIZONTAL VECTOR                   VECTOR  B1
R3067       BETA1       1+X(T2)**2                               DP      B1
R3069       PHI2        PERIGEE OR APOGEE INDICATOR              DP      B2       -1 PERIGEE,+1 APOGEE
R3071
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R3072   OUTPUT
R3073     V2(T1)/       POST IMPULSE INITIAL VELOCITY VECTOR          VECTOR  B7      METERS/CS
R3075     R(T2)/        FINAL POSITION VECTOR                         VECTOR  B29     METERS
R3077     V(T2)/        FINAL VELOCITY VECTOR                         VECTOR  B7      METERS/CS
R3079     T2            FINAL TIME                                    DP      B28     CENTISECONDS
R3081
R3100   DEBRIS
R3101     RD            FINAL R DESIRED                               DP      B29/B27 METERS
R3111     R/APRE        R/A                                           DP      B6
R3113     P/RPRE        P/R                                           DP      B2
R3115     RPRE          MAGNITUDE OF R(T2)/                           DP      B29/B27 METERS
R3117     X(T2)PRE      COTANGENT OF GAMMA2                           DP      B0
R3119     DT12          CORRECTION TO FINAL TIME T2                   DP      B28     CENTISECONDS
R3121     RCON          FINAL RADIUS                                  DP      B29/B27 METERS
R3123     DRCON         DELTA RCON                                    DP      B29/B27 METERS
R3125
 3150                             32,2515  71220 1  PREC100  STQ     DLOAD
 3151   MPY  13  LAST  859       32,2516  03762 1           STORE   SPRTEX
 3156   MPY   1                  32,2517  31705 1           STORE   10RTE
 3157   MPY   5  LAST  847       32,2520  17730 0           STODL   NN1A
 3158   MPY   7  LAST  647       32,2521  03636 1           STORE   RCON
 3159   MPY   2  LAST  125       32,2522  03664 0           STORE   RD
 3164                             32,2523  77745 1  PREC120  DLOAD
31645   MPY   1                  32,2524  31715 0           STORE   2RTEB1
31646   MPY   2  LAST  125       32,2525  17650 1           STODL   DT21PR      DT21PR = POSMAX
 3165   MPY   1                  32,2526  31703 1           STORE   M15RTE
 3166   MPY   2  LAST  125       32,2527  37732 0           STCALL  NN2
 3169   MPY   1                  32,2530  65103 0           STORE   RTENCK3
 3170                             32,2531  77624 1  PREC125  CALL
 3171   MPY   1                  32,2532  11527 1           STORE   PARAM
 3172                             32,2533  77745 1           DLOAD
 3173   MPY   2  LAST   94       32,2534  02742 1           STORE   P
 3222   MPY   1                  32,2535  14033 1           STODL   P/RPRE
 3223   MPY   2  LAST   94       32,2536  02744 1           STORE   R1A
 3224   MPY   1                  32,2537  14035 1           STODL   R/APRE
 3225   MPY   1                  32,2540  00041 1           STORE   R1
 3226   MPY   1                  32,2541  14031 0           STODL   RPRE
 3227   MPY   3  LAST  124       32,2542  03775 1           STORE   COGA
 3228                             32,2543  77661 0           SL
 3229                             32,2544  20206 1           STORE   5
 3230   MPY   1                  32,2545  03724 0           STORE   X(T2)PRE
 3241                             32,2546  43276 0           DCOMP   DAD
 3242   MPY  10  LAST  847       32,2547  03726 1           STORE   X(T2)
 3243                             32,2550  45246 0           ABS     DSU
 3244   MPY   1                  32,2551  31760 1           STORE   EPC4RTE
 3245                             32,2552  50000 1           BOV     BMN
32455   MPY   1                  32,2553  64555 0           STORE   PREC130
 3246   MPY   1                  32,2554  64736 1           STORE   PREC175

R3247   DESIRED REENTRY ANGLE NOT ACHIEVED
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3246
3249  REP  3  LAST  661     32,2555  50145 1  PREC130  DLOAD  BMN
3250  REP  1                32,2556  03732 1                 NN2
3251                        32,2557  64563 0                 PREC140
3252  REP  2  LAST  647     32,2560  52135 1  PREC132  SLOAD  GOTO      TOO MANY ITERATIONS
3253  REP  1                32,2561  31735 1                 OCT805      EXIT WITH ALARM
                            32,2562  65053 1                 PRECX

R3259  DETERMINE RADIUS AT WHICH THE DESIRED REENTRY ANGLE WILL BE ACHIEVED

3260
3261  REP  6  LAST  661     32,2563  53145 1  PREC140  DLOAD  BZE
3264  REP  1                32,2564  03730 0                 NN1A
3265                        32,2565  64616 1                 PREC162
3266  REP  2  LAST  661     32,2566  42545 0  PREC150  DLOAD  SL4       ELLIPTIC CASE
32665                       32,2567  00035 1                 R/APRE
3267  REP  2  LAST  661     32,2570  52525 1           PDDL  SL3                          PL02D
3268                        32,2571  00033 1                 P/RPRE
3269  REP  3  LAST  647     32,2572  41205 0           DMP   DMP       (P/A)BETA1         B4 PL00D
3270                        32,2573  03754 1                 BETA1
3271                        32,2574  57512 0           SL2   DCOMP
3272  REP  6  LAST  859     32,2575  50015 0           DAD   BMN       1-(P/A)BETA1=BETA2  B2
3273  REP  1                32,2576  31655 0                 1RTEB2
3274                        32,2577  64602 1                 PREC155
3275  REP  1                32,2600  52166 1           SQRT  GOTO      BETA2**.5=BETA3    B1
3276                        32,2601  64604 1                 PREC160
3277  REP  3  LAST  659     32,2602  77745 1  PREC155  DLOAD
3278                        32,2603  31677 0                 ZERORTE   BETA3=0
3279  REP  3  LAST  846     32,2604  43205 1  PREC160  DMP   DAD
3280  REP  1                32,2605  03761 1                 PHI2
3281                        32,2606  31657 1                 1RTEB3
3282  REP  3  LAST  662     32,2607  60325 0           PDDL  NORM      1+(PHI2)(BETA3)    B3
3283  REP 38  LAST  649     32,2610  00035 1                 R/APRE
3284                        32,2611  00047 1                 X1
3285                        32,2612  77665 1           BDDV
3286                        32,2613  52057 1           SL*   GOTO                               PL00D
3287  REP  1                32,2614  20175 0                 0 -4,1    (1+PHI2*BETA3)/(R/A)=BETA4  B1
3288                        32,2615  64624 0                 PREC165
32665 REP  2  LAST  661     32,2616  60345 0  PREC162  DLOAD  NORM
3289  REP 39  LAST  662     32,2617  00031 0                 RPRE
32695                       32,2620  00047 1                 X1
3290  REP  3  LAST  661     32,2621  53665 1           BDDV  SL*       BETA4=RD/RPRE      B1
32905                       32,2622  03664 0                 RD
3291                        32,2623  20200 1                 0 -1,1
3292  REP  1                32,2624  45206 1  PREC165  PUSH  DSU
32923                       32,2625  31653 0                 1RTEB1
329235 REP 2  LAST  116     32,2626  77676 0           DCOMP
32924                       32,2627  03765 0           STORE BETA12
329243 REP 1                32,2630  71240 1           BMN   DLOAD
329247 REP 2  LAST  661     32,2631  64642 0                 PREC166
32925                       32,2632  03724 0                 X(T2)PRE
                            32,2633  71240 1           BMN   DLOAD
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329253 REF   1                32,2634  64640 1                    PREC167
329257 REF   3  LAST  662      32,2635  03765 0                    BETA12
32926                         32,2636  77676 0          DCOMP
329265 REF   4  LAST  663      32,2637  03765 0          STORE     BETA12
32927                         32,2640  77745 1  PREC167 DLOAD
329275 REF   5  LAST  663      32,2641  03765 0                    BETA12
3293                          32,2642  45246 0  PREC166 ABS       DSU
3294   REF   1                32,2643  31764 0                    EPC6RTE
3295                          32,2644  71240 1          BMN       DLOAD
3296   REF   2  LAST  661      32,2645  64736 1                    PREC175
3297                          32,2646  72405 0          DMP       SL1
3298   REF   3  LAST  662      32,2647  00031 0                    RPRE
3299                          32,2650  77606 1          PUSH                 RP = NEW RADIUS
3300                          32,2651  43345 1  PREC170 DLOAD     DAD
3301   REF   4  LAST  662      32,2652  03732 1                    NN2
3302   REF   2  LAST  847      32,2653  31675 1                    1RTEB26
3303   REF   5  LAST  663      32,2654  03732 1          STORE     NN2
3304                          32,2655  43175 0          VLOAD     SET
3305   REF  10  LAST  856      32,2656  03656 1                    R(T2)/
3306   REF   6  LAST  854      32,2657  03466 0                    RVSW
3307   REF   9  LAST  656      32,2660  26657 1          STOVL     RVEC
3306   REF   6  LAST  656      32,2661  03710 1                    V(T2)/
3309                          32,2662  77765 0          SIGN
3310   REF   6  LAST  863      32,2663  03765 0                    BETA12
3311   REF  13  LAST  656      32,2664  16746 0          STODL     VVEC
3312   REF   2  LAST  662      32,2665  31653 0                    1RTEB1
3313                          32,2666  57565 0          SIGN      DCOMP
3314   REF   7  LAST  663      32,2667  03765 0                    BETA12
3315                          32,2670  71354 0          LXA,2     DLOAD
3316   REF 267  LAST  653      32,2671  00154 1                    MPAC
3317                          32,2672  67140 0          LXC,1     SXA,2
3316   REF   4  LAST  654      32,2673  03734 1                    CONICX1
3320   REF   3  LAST  654      32,2674  02756 1                    SGNRDOT
3321   REF   4  LAST  656      32,2675  36760 0          STCALL    RDESIRED      COMPUTE DT12 (CORRECTION TO TIME OF
3322   REF   2  LAST  854      32,2676  25552 1                    TIMERAD             NEW RADIUS)
3323                          32,2677  75345 1          DLOAD     SIGN
3324   REF   8  LAST  854      32,2700  00037 0                    T
3325   REF   6  LAST  663      32,2701  03765 0                    BETA12
3326                          32,2702  60325 0          PDDL      NORM          DT21=(PHI4)DT21                    PL02D
3327   REF   3  LAST  661      32,2703  03650 1                    DT21PR
3326   REF  40  LAST  662      32,2704  00047 1                    X1
3329                          32,2705  53665 1          BDDV      SL*
3330                          32,2706  00001 0                    00D
33305                         32,2707  20176 0                    0 -3,1
3331                          32,2710  50006 1          PUSH      BMN           BETA13=(DT21)/(DT21PR)             B3 PL04D
33315  REF   1                32,2711  64716 0                    PREC172
3332                          32,2712  65345 0          DLOAD     PDDL          BETA14=1                           B0 PL04D
33325  REF   2  LAST  861      32,2713  31715 0                    2RTEB1
3333                          32,2714  77650 1          GOTO
33335  REF   1                32,2715  64720 0                    PREC173
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3334
33345 REP  1                    32,2716  65345 0  PREC172  DLOAD  PDDL          BETA14=.6                          B0 PL04D
                                32,2717  31707 0           .      M.6RTB
3335                            32,2720  45271 1  PREC173  DDV    DSU
33355                           32,2721  00003 1           .      02D
3336  REP  2  LAST  862         32,2722  31657 1                  1RTEB3
33365                           32,2723  71240 1           BMN    DLOAD
3337  REP  1                    32,2724  64730 1                  PREC174
33375                           32,2725  77605 1           DMP
3338  REP  4  LAST  863         32,2726  03650 1                  DT21PR
33385                           32,2727  00001 0           STORE  00D            DT21=(BETA14)DT21PR                B28
3339                            32,2730  41545 0  PREC174  DLOAD  PUSH
33395                           32,2731  00001 0                  00D
3340  REP  5  LAST  864         32,2732  37650 0           STCALL DT21PR
3341  REP  1                    32,2733  65065 1                  RTENCK2
3342                            32,2734  77650 1           GOTO
3343  REP  1                    32,2735  64531 1                  PREC125
3356                            32,2736  45345 1  PREC175  DLOAD  DSU
3357  REP  4  LAST  863         32,2737  00031 0                  RPRE
3358  REP  4  LAST  862         32,2740  03864 0                  RD
3359                            32,2741  51406 1           PUSH   ABS            RPRE-RD = RERR
3360                            32,2742  50025 0           DSU    BMN
3361  REP  1                    32,2743  31766 1                  EPC7RTB
3362  REP  1                    32,2744  65037 0                  PREC220

R3363  DESIRED RADIUS HAS NOT BEEN ACHIEVED

3364
3365  REP  7  LAST  862         32,2745  53145 1           DLOAD  BZE
3366  REP  1                    32,2746  03730 0                  NN1A
3367                            32,2747  64560 0                  PREC132
                                32,2750  53025 0           DSU    BZE            TOO MANY ITERATIONS
3368  REP  2  LAST  861         32,2751  31705 1                  10RTB
3369  REP  1                    32,2752  65005 1                  PREC207
3370                            32,2753  45345 1  PREC205  DLOAD  DSU
3371  REP  4  LAST  847         32,2754  03670 0                  RPRE,          NOT FIRST PASS OF ITERATION
3372  REP  5  LAST  864         32,2755  00031 0                  RPRE
3373                            32,2756  55301 0           NORM   BDDV           RPRE,-RPRE                         B29/B27
3374  REP 15  LAST  789         32,2757  00050 1                  X2
3375  REP  4  LAST  847         32,2760  03666 1                  DRCON
33755                           32,2761  41457 1           SL*    PUSH           DRCON/(RPRE,-RPRE)=S               B2
3376                            32,2762  57600 0                  0 -2,2
33765                           32,2763  40015 1           DAD    BOV
3377  REP  3  LAST  863         32,2764  31653 0                  1RTEB1         S GR +4 OR LS -4
33775 REP  1                    32,2765  64772 1                  PREC205M
3378                            32,2766  45246 0           ABS    DSU
33785 REP  4  LAST  864         32,2767  31653 0                  1RTEB1
3379                            32,2770  77640 0           BMN
33795 REP  1                    32,2771  64775 0                  PREC206
3380                            32,2772  57545 1  PREC205M DLOAD  DCOMP          S GR 0 OR LS -4
33805 REP  3  LAST  863         32,2773  31715 0                  2RTEB1
3381                            32,2774  77725 1           PDDL           .      S=-4                               B2
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33815                          32,2775  41345 0 PREC206  DLOAD   DMP
3382                           32,2776  77712 0          SL2
33825 REF   5  LAST  864       32,2777  03666 1          STORE   DRCON        DRCON=S(RERR)                  B29
3383                           32,3000  77615 0          DAD
3384  REF   8  LAST  861       32,3001  03636 1                  RCON
3385  REF   9  LAST  865       32,3002  03636 1          STORE   RCON         RCON+DRCON=RCON
3386                           32,3003  77650 1          GOTO
3387  REF   1                  32,3004  65024 1                  PREC210
3388                           32,3005  63545 0 PREC207  DLOAD   DSQ          FIRST PASS OF ITERATION
3389  REF   5  LAST  864       32,3006  03664 0                  RD
3390                           32,3007  70501 1          NORM    SR1
3391  REF  41  LAST  863       32,3010  00047 1                  X1
3392                           32,3011  60325 0          PDDL    NORM
3393  REF   6  LAST  864       32,3012  00031 0                  RPRE
3394  REF  16  LAST  864       32,3013  00050 1                  X2
3395                           32,3014  55260 0          XSU,1   BDDV
3396  REF  17  LAST  865       32,3015  00047 1                  X2
3397                           32,3016  77657 0          SR*
3398                           32,3017  20600 0                  0 -1,1
3399  REF  10  LAST  865       32,3020  03636 1          STORE   RCON         RD**2/RPRE=RCON
3400                           32,3021  77625 0          DSU
3401  REF   6  LAST  865       32,3022  03664 0                  RD
3402  REF   6  LAST  865       32,3023  03666 1          STORE   DRCON        RCON-RD=DRCON
3403                           32,3024  77745 1 PREC210  DLOAD                 PREPARE FOR NEXT ITERATION
3404  REF   7  LAST  865       32,3025  00031 0                  RPRE
3405  REF   5  LAST  864       32,3026  17670 0          STODL   RPRE,
3406  REF   8  LAST  864       32,3027  03730 0                  NN1A
3407                           32,3030  77625 0          DSU
3408  REF   3  LAST  863       32,3031  31675 1                  1RTER28
3409  REF   9  LAST  865       32,3032  37730 1          STCALL  NN1A
3410  REF   2  LAST  845       32,3033  65136 0                  V2T100
3411                           32,3034  52030 0          BHIZ    GOTO
3412  REF   1                  32,3035  64523 1                  PREC120
3413  REF   2  LAST  862       32,3036  65053 1                  PRECX

R3414  DESIRED RADIUS ACHIEVED

3415                           32,3037  45345 1 PREC220  DLOAD   DSU
3416  REF  11  LAST  861       32,3040  03726 1                  X(T2)
3417  REF   3  LAST  862       32,3041  03724 0                  X(T2)PRE
3418                           32,3042  45246 0          ABS     DSU
3419  REF   1                  32,3043  31770 0                  EPC8RTE
3420                           32,3044  67240 0          BMN     SLOAD
3421  REF   1                  32,3045  65051 0                  PREC225
3422  REF   1                  32,3046  31737 0                  OCT813
3423                           32,3047  77650 1          GOTO
3424  REF   3  LAST  865       32,3050  65053 1                  PRECX          IF REENTRY ANGLE OUT OF LIMITS

R3425  DESIRED FINAL ANGLE HAS BEEN REACHED
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3429
3430    REP   4  LAST  662    32,3051   77745 1  PREC225  DLOAD
3431                          32,3052   31677 0                  ZERORTE
3432    REP  14  LAST  861    32,3053   77650 1  PRECX    GOTO
                              32,3054   03762 1                  SPRTEX
```

P3800 INTEGRATION CALLING SUBROUTINE

R3801 DESCRIPTION
R3802 PERFORMS CONIC AND PRECISION INTEGRATIONS USING SUBROUTINE INTEGRVS. THERE ARE THREE ENTRANCES (RTENCK1,
R3804 RTENCK2 AND RTENCK3) FOR DIFFERENT SOURCES OF INPUT AND DIFFERENT OPTIONS. THERE IS A COMMON SET OF OUTPUT
R3806 WHICH INCLUDES SET UP OF INPUT FOR THE PARAM SUBROUTINE

R3807 RTENCK1 (CONIC INTEGRATION)

R3808 CALLING SEQUENCE
R3809 L CALL
R3810 L+1 RTENCK1

R3811 ERASABLE INITIALIZATION REQUIRED
R3812 SAME AS FOR THE RTENCK3 ENTRANCE

R3813 RTENCK2 (PRECISION INTEGRATION)

R3814 CALLING SEQUENCE
R3815 L CALL
R3816 L+1 RTENCK2

R3817 ERASABLE INITIALIZATION REQUIRED
R3818 PUSHLIST
R3819 PUSHLOC-2 INTEGRATION TIME DT12 (CORRECTION TO T2) DP B28 CS
R3821 OTHER
R3822 R(T2)/ FINAL POSITION VECTOR VECTOR B29 METERS
R3824 V(T2)/ FINAL VELOCITY VECTOR VECTOR B7 METERS/CS
R3826 T2 FINAL TIME DP B28 CS

R3828 RTENCK3 (PRECISION INTEGRATION)

R3829 CALLING SEQUENCE
R3830 L CALL
R3831 L+1 RTENCK3

R3832 ERASABLE INITIALIZATION REQUIRED
R3834 R(T1)/ INITIAL POSITION VECTOR VECTOR B29 METERS
R3836 V2(T1)/ POST IMPULSE INITIAL VELOCITY VECTOR VECTOR B7 M/CS
R3838 T1 INITIAL VECTOR TIME DP B28 CS
R3840 T2 FINAL TIME DP B28 CS

R3842 EXIT MODE
R3843 AT L+2 OF CALLING SEQUENCE
R3844 SUBROUTINES CALLED
R3845 INTSTALL
R3846 INTEGRVS

R3847 OUTPUT
R3848 PUSHLIST

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R3649 PUSHLOC-6 FINAL POSITION VECTOR R(T_2)/
R3851 X1 CONICS MUTABLE ENTRY FOR EARTH (-2)
R3853 MPAC
R3854 FINAL VELOCITY VECTOR V(T_2)/
R3856 OTHER
R3857 R(T_2)/ AS IN PUSHLIST
R3858 V(T_2)/ AS IN MPAC
R3859 T_2 FINAL TIME
R3861

VECTOR B_{29} METERS
SP B_{14}

VECTOR B_7 M/CS

DP B_{28} CS

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 3897                                32,3055  45020 1  RTENCK1  STQ     CALL
 3898  REF   6  LAST  854            32,3056  03733 0                   RTENCKEX
 3899  REF  16  LAST  624            32,3057  27371 1                   INTSTALL
 3900                                32,3060  43175 0           VLOAD   SET
 3901  REF   6  LAST  859            32,3061  03640 0                   R(T1)/
 3902  REF  10  LAST  601            32,3062  01473 0                   INTYPFLG
 3903                                32,3063  77650 1           GOTO
 3904  REF   1                       32,3064  65111 0                   RTENCK3B
R3905

 3906                                32,3065  45020 1  RTENCK2  STQ     CALL .
 3907  REF   9  LAST  866            32,3066  03733 0                   RTENCKEX
 3908  REF  19  LAST  668            32,3067  27371 1                   INTSTALL
 3909                                32,3070  77214 0           CLEAR   VLOAD
 3910  REF  11  LAST  666            32,3071  01673 1                   INTYPFLG
 3911  REF  11  LAST  663            32,3072  03656 1                   R(T2)/
 3912  REF  10  LAST  503            32,3073  25535 0           STOVL   RCV
 3913  REF   9  LAST  663            32,3074  03710 1                   V(T2)/
 3914  REF   9  LAST  503            32,3075  15543 1           STODL   VCV
 3915  REF   5  LAST  656            32,3076  03736 0                   T2
 3916  REF  10  LAST  503            32,3077  01517 0           STORE   TET
 3917                                32,3100  77615 0           DAD
 3916                                32,3101  77650 1           GOTO
 3919  REF   1                       32,3102  65117 0                   RTENCK3D

R3920
 3921                                32,3103  45020 1  RTENCK3  STQ     CALL
 3922  REF  10  LAST  666            32,3104  03733 0                   RTENCKEX
 3923  REF  20  LAST  668            32,3105  27371 1                   INTSTALL
 3925                                32,3106  43175 0  RTENCK3A VLOAD   CLEAR
 3926  REF   7  LAST  866            32,3107  03640 0                   R(T1)/
 3927  REF  12  LAST  668            32,3110  01673 1                   INTYPFLG
 3928  REF  11  LAST  868            32,3111  25535 0  RTENCK3B STOVL   RCV
 3929  REF   6  LAST  856            32,3112  03700 0                   V2(T1)/
 3930  REF  10  LAST  868            32,3113  15543 1           STODL   VCV
 3931  REF   6  LAST  858            32,3114  03716 1                   T1
 3932  REF  11  LAST  868            32,3115  15517 0           STODL   TET
 3933  REF   6  LAST  868            32,3116  03736 0                   T2
 3934  REF  45  LAST  858            32,3117  00041 1  RTENCK3D STORE   TDEC1
 3935                                32,3120  45014 0           CLEAR   CALL
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```
3936  REF  11  LAST  504  32,3121  00263 0          MOONFLAG
3937  REF   6  LAST  503  32,3122  27066 1          INTEGRVS
3938                      32,3123  77775 1    VLOAD
3939  REF  34  LAST  858  32,3124  00001 0          RATT
3950  REF  12  LAST  868  32,3125  03656 1    STORE R(T2)/
3951                      32,3126  70125 0    PDDL  LXC,1
3952  REF   8  LAST  858  32,3127  00015 0          TAT
3953  REF   5  LAST  863  32,3130  03734 1          CONICX1
3954  REF   7  LAST  868  32,3131  27736 0    STOVL T2
3955  REF  23  LAST  858  32,3132  00007 0          VATT
3956  REF  10  LAST  868  32,3133  03710 1    STORE V(T2)/
3957                      32,3134  77650 1    GOTO
3958  REF  11  LAST  868  32,3135  03733 0          RTENCKEX
```

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L       P37,P70                                                 USER=S PAGE NO. 28      E7 S3

P4000   V2(T1) COMPUTATION SUBROUTINE

R4001   DESCRIPTION
R4002   A POST IMPULSE VELOCITY VECTOR (V2(T1)) IS COMPUTED WHICH EITHER
R4003   (1) MEETS THE INPUT VELOCITY CHANGE DESIRED (RTEDVD) IN A MINIMUM TIME  OR
R4005   (2) IF A VELOCITY CHANGE ISN'T SPECIFIED (RTEDVD) = 0), A V2(T1) IS COMPUTED WHICH MINIMIZES THE IMPULSE (DV)
R4007   AND CONSEQUENTLY FUEL.

R4008   CALLING SEQUENCE
R4009     L       CALL
R4010     L+1             V2T100

R4011   NORMAL EXIT MODE
R4012     AT L+2 OF CALLING SEQUENCE WITH MPAC = 0

R4013   ALARM EXIT MODE
R4014     AT L+2 OF CALLING SEQUENCE WITH MPAC = OCTAL 605 FOR EXCESS ITERATIONS

R4015   SUBROUTINES CALLED
R4016     GAMDV10
R4017     XT1LIM
R4018     DVCALC

R4019   ERASABLE INITIALIZATION REQUIRED
R4020     PUSHLIST
R4021       NONE
R4022     MPAC
R4023       NONE
R4024     OTHER
R4025       R(T1)       MAGNITUDE OF INITIAL POSITION VECTOR          DP      B29/B27 METERS
R4027       RCON        MAGNITUDE OF FINAL POSITION VECTOR            DP      B29/B27 METERS
R4029       V(T1)/      INITIAL VELOCITY VECTOR                       VECTOR  B7/B5   METERS/CS
R4031       RTEDVD      DELTA VELOCITY DESIRED                        DP      B7/B5   METERS/CS
R4033       UR1/        UNIT INITIAL VECTOR                           VECTOR  B1
R4035       UH/         UNIT HORIZONTAL VECTOR                        VECTOR  B1
R4037       X(T2)       COTANGENT OF FINAL FLIGHT PATH ANGLE          DP      B0
R4039       X(T1)       COTANGENT OF INITIAL FLIGHT PATH ANGLE(INPUT FOR PREC)  DP  B5
R4041       CPPA        COSINE OF INITIAL FLIGHT PATH ANGLE           DP      B1
R4043       MAMAX1      MAJOR AXIS LIMIT FOR LOWER BOUND ON GAMDV ITERATOR  DP  B30/B28 METERS
R4045       MAMAX2      MAJOR AXIS LIMIT FOR UPPER BOUND ON GAMDV ITERATOR  DP  B30/B28 METERS
R4049       PHI2        REENTRY NEAR PERIGEE OR APOGEE INDICATE (RTE ONLY)  DP  B2      -1 PERIGEE,+1 APOGEE
R4051       N1          CONIC OR PRECISION ITERATION COUNTER          DP      B28     NEGATIVE CONIC,PLUS PREC
R4053
R4054   OUTPUT
R4055       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR          VECTOR  B7/B5   METERS/CS
R4057       DV          INITIAL VELOCITY CHANGE                       DP      B7/B5   METERS/CS
R4059       X(T1)       COTANGENT OF INITIAL FLIGHT PATH ANGLE (POST IMPULSE)  DP  B5
R4061       PCON        SEMI-LATUS RECTUM                             DP      B28/B26 METERS
R4063       BETA1       1+X(T2)**2                                    DP      B1
R4067
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R4066   DEBRIS
R4069     PUSHLIST
R4070       00D         X(T1),,=PREVIOUS PRECISION X(T1)                    DP      B5
R4074       02D         THETA1=BETA5*LAMBDA-1                               TP      B17
R4076       05D         THETA2=2*R(T1)*(LAMBDA-1)                           TP      B36/B36
R4076       08D         THETA3=MU**.5/R(T1)                                 DP      B-4/B-5
R4060       10D         X(T1)MIN=LOWER BOUND ON X(T1) IN GAMDV ITERATOR     DP      B5
R4062       12D         DX(T1)MAX=MAXIMUM DELTA X(T1)                       DP      B5
R4064       14D         X(T1)MAX=UPPER BOUND ON X(T1) IN GAMDV ITERATOR     DP      B5
R4066       16D         DX(T1)=ITERATOR INCREMENT                           DP      B5
R4066       31D         GAMDV10 SUBROUTINE RETURN ADDRESS
R4069       32D         DVCALC SUBROUTINE RETURN ADDRESS
R4090       33D         V2T100 SUBROUTINE RETURN ADDRESS

 4100                           32,3136  77620 0  V2T100   STQ
 4101                           32,3137  00041 1           33D
 4104                           32,3140  43001 1           SETPD   CLEAR
 4105                           32,3141  00001 0                   0                                                   PL00D
 4106   REF   1                 32,3142  00272 0                   P2RTE
 4107                           32,3143  60345 0           DLOAD   NORM
 4108   REF  11  LAST  865      32,3144  03636 1                   RCON
 4109   REF  42  LAST  865      32,3145  00047 1                   X1
 4110                           32,3146  60325 0           PDDL    NORM
 4111   REF   5  LAST  859      32,3147  03646 0                   R(T1)
 4112   REF  33  LAST  836      32,3150  00051 0                   S1
 4113                           32,3151  00013 0           STORE   10D
 4114                           32,3152  56342 1           SR1     DDV       R1/RCON = LAMBDA                  B1
 4115                           32,3153  65260 0           XSU,1   PDDL                                        PL02D
 4116   REF  34  LAST  671      32,3154  00050 1                   S1
 4117   REF  12  LAST  665      32,3155  03726 1                   X(T2)
 4118                           32,3156  77716 1           DSQ
 4120                           32,3157  43342 0           SR1     DAD
 4121   REF   5  LAST  664      32,3160  31653 0                   1RTEB1
 4122   REF   4  LAST  662      32,3161  03754 1           STORE   BETA1     1+X(T2)**2 = BETA1                B1
 4123                           32,3162  77605 1           DMP
 4124                           32,3163  00001 0                   00D
41245                           32,3164  00035 1           STORE   28D       BETA1*LAMBDA = BETA5
41246                           32,3165  53605 1           DMP     SL*
412461                          32,3166  00001 0                   00D
412462                          32,3167  20172 1                   0 -7,1
 4125                           32,3170  45257 0           SL*     DSU
 4126                           32,3171  20172 1                   0 -7,1
 4127   REF   1                 32,3172  31671 0                   1RTEB17
 4128                           32,3173  65234 1           RTB     PDDL      BETA5*LAMBDA-1 = THETA1           B17 PI.05D
41262   REF   3  LAST  617      32,3174  45562 1                   TPMODE
41285   REF   6  LAST  671      32,3175  31653 0                   1RTEB1
41267                           32,3176  57457 0           SR*     DCOMP
 4129                           32,3177  20601 1                   0,1
41295                           32,3200  41215 1           DAD     DMP
 4130                           32,3201  00001 0                   00D
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```
41302 REF  6 LAST 871   32,3202  03846 0                 R(T1)
41305                   32,3203  47057 0          SL*    RTB
41307                   32,3204  20172 1                 0 -7D,1
4131  REF  4 LAST 871   32,3205  45562 1                 TPMODE
4132                    32,3206  77725 1          PDDL                2*R(T1)*(LAMBDA-1)=THETA2  B38/B36 PL08D
4133  REF  1            32,3207  33770 1                 RTMURTE
4134                    32,3210  70501 1          NORM   SR1
4135  REF 18 LAST 865   32,3211  00050 1                 X2
4136                    32,3212  58284 1          XSU,2  DDV
4137  REF 35 LAST 871   32,3213  00050 1                 S1
4138                    32,3214  00013 0                 10D
4139                    32,3215  65257 1          SR*    PDDL                MU**.5/R(T1)=THETA3        B-4/B-5 PL10D
4140                    32,3216  57170 0                 6,2
4141  REF  3 LAST 845   32,3217  03852 0                 MAMAX1
4142                    32,3220  41406 0          PUSH   PUSH                MAMAX1=MA
4143                    32,3221  77624 1          CALL
4144  REF  1            32,3222  58633 1                 XT1LIM
4145                    32,3223  41476 1          DCOMP  PUSH                X(T1)MIN                   B5 PL12D
4146                    32,3224  40478 0          DCOMP  SR4
4147                    32,3225  41525 0          PDDL   PUSH                DX(T1)MAX                  B5 PL14D
4148  REF  3 LAST 845   32,3226  03854 0                 MAMAX2
4149                    32,3227  45008 0          PUSH   CALL
4150  REF  2 LAST 872   32,3230  58633 1                 XT1LIM
4151                    32,3231  50125 1          PDDL   BMN                 X(T1)MAX                   B5 PL16D
4152  REF 10 LAST 865   32,3232  03730 0                 NN1A
4153  REF  1            32,3233  65236 0                 V2T102
4154                    32,3234  77650 1          GOTO
4155  REF  1            32,3235  65250 0                 V2T110

R4156  PROCEED HERE IF NOT PRECISION COMPUTATION

4158                    32,3236  77745 1 V2T102   DLOAD
4159  REF  5 LAST 644   32,3237  03632 0                 RTEDVD
4160                    32,3240  52054 1          BZE    GOTO
4161  REF  1            32,3241  65243 1                 V2T105
4162  REF  1            32,3242  65344 1                 V2T140
4163                    32,3243  50145 1 V2T105   DLOAD  BMN
4164  REF  3 LAST 859   32,3244  03757 1                 CPPA
4165  REF  2 LAST 872   32,3245  65344 1                 V2T140
4166                    32,3246  77650 1          GOTO
4167  REF  1            32,3247  65352 0                 V2T145

R4168  DURING A PRECISION TRAJECTORY ITERATION CONSTRAIN THE INDEPENDENT
R4169  VARIABLE TO INSURE THAT ALL CONICS PASS THROUGH RCON ON THE SAME PASS
R4170  THROUGH X(T2)

4171                    32,3250  47145 1 V2T110   DLOAD  RTB
4172  REF  2 LAST 871   32,3251  31671 0                 1RTER17
4173  REF  5 LAST 872   32,3252  45562 1                 TPMODE
4174                    32,3253  85276 1          DCOMP  PDDL                -1                         B17 PL19D
```

```
4175  REF  4  LAST  864   32,3254  31715 0            2RTEB1
4176                       32,3255  45257 0       SR*  DSU
41765                      32,3256  20601 1            0,1
4177                       32,3257  00001 0            00D
41775                      32,3260  53605 1       DMP  SL*
4178                       32,3261  00035 1            28D
41785                      32,3262  20172 1            0 -7,1
4179                       32,3263  76257 0       SL*  TAD
41795                      32,3264  20172 1            0 -7,1
4180                       32,3265  65234 1       RTB  PDDL     BETA5(2-LAMBDA)-1=BETA6        B17 PL19D
4181  REF  6  LAST  872    32,3266  45562 1            TPMODE
4182  REF  2  LAST  125    32,3267  03722 0            X(T1)
4183                       32,3270  00001 0       STORE 00D     X(T1),,                        B5
4184                       32,3271  77751 1       TLOAD                                        PL16D
4185                       32,3272  53040 0       BMN   BZE
4186  REF  1               32,3273  65300 1             V2T115
41865 REF  2  LAST  873    32,3274  65300 1             V2T115
4167                       32,3275  52061 1       SL    GOTO
4188                       32,3276  20210 0             7
4189  REF  1               32,3277  65311 1             V2T120
4190                       32,3300  50145 1 V2T115 DLOAD BMN
4191  REF  4  LAST  862    32,3301  03761 1             PHI2
4192  REF  1               32,3302  65322 1             V2T125
4193                       32,3303  77676 0       DCOMP
4194  REF  5  LAST  873    32,3304  17761 1       STODL PHI2
4195  REF  3  LAST  864    32,3305  31705 1             10RTB
4196  REF  11 LAST  872    32,3306  03730 0       STORE NN1A
4197                       32,3307  77650 1       GOTO
4198  REF  2  LAST  873    32,3310  65322 1             V2T125
4199                       32,3311  47166 0 V2T120 SQRT  RTB
4200  REF  2  LAST  494    32,3312  45713 0             DPMODE
42005                      32,3313  50125 1       PDDL  BMN     BETA6**.5=X(T1)LIM             B5 PL18D
4201  REF  6  LAST  873    32,3314  03761 1             PHI2
4202  REF  1               32,3315  65330 1             V2T130
4203                       32,3316  45545 1       DLOAD STADR                                  PL16D
4204                       32,3317  77760 0       STORE 14D     X(T1)LIM = X(T1)MAX
4205                       32,3320  77676 0       DCOMP
4206                       32,3321  00013 0       STORE 10D     -X(T1)LIM = X(T1)MIN
4207                       32,3322  53145 1 V2T125 DLOAD BZE
4208  REF  3  LAST  873    32,3323  03722 0             X(T1)
4209  REF  3  LAST  872    32,3324  65344 1             V2T140
4210                       32,3325  52040 1       BMN   GOTO
4211  REF  4  LAST  873    32,3326  65344 1             V2T140
4212  REF  2  LAST  872    32,3327  65352 0             V2T145
4213                       32,3330  53145 1 V2T130 DLOAD BZE
4214  REF  4  LAST  873    32,3331  03722 0             X(T1)
4215  REF  1               32,3332  65341 1             V2T135
4216                       32,3333  71240 1       BMN   DLOAD                                  PL16D
4217  REF  2  LAST  873    32,3334  65341 1             V2T135
4218                       32,3335  77828 0       STADR
```

```
4219                                32,3336  77784 1                STORE  10D
4220                                32,3337  77850 1                GOTO
4221  REP  3  LAST  873             32,3340  65352 0                       V2T145
4222                                32,3341  57545 1  V2T135  DLOAD  DCOMP
4223                                32,3342  77828 0                STADR
4224                                32,3343  77780 0                STORE  14D
4225                                32,3344  77745 1  V2T140  DLOAD
4226                                32,3345  00013 0                       10D
4227  REP  5  LAST  873             32,3346  17722 0                STODL  X(T1)
4228                                32,3347  00015 0                       12D
4229                                32,3350  52008 0                PUSH   GOTO
4230  REP  1                        32,3351  65357 0                       V2T150
4231                                32,3352  77745 1  V2T145  DLOAD
4232                                32,3353  00017 1                       14D
4233  REP  6  LAST  874             32,3354  17722 0                STODL  X(T1)
4234                                32,3355  00015 0                       12D
4235                                32,3356  41478 1                DCOMP  PUSH
4236                                32,3357  77824 1  V2T150  CALL
4237  REP  1                        32,3360  65500 1                       GAMDV10
4238                                32,3361  53145 1                DLOAD  BZE
4239  REP  6  LAST  872             32,3362  03832 0                       RTEDVD
4240  REP  1                        32,3363  65478 1                       V2T1X

R4241  CONTINUE IF TIME CRITICAL MODE

4242                                32,3364  50025 0                DSU    BMN
4243  REP  3  LAST  849             32,3365  03708 0                       DV
4244  REP  1                        32,3366  65371 1                       V2T155
4245                                32,3367  77850 1                GOTO
4246  REP  1                        32,3370  85424 0                       V2T175
4247                                32,3371  50145 1  V2T155  DLOAD  BMN
4248  REP  12  LAST  873            32,3372  03730 0                       NN1A
4249  REP  1                        32,3373  85378 0                       V2T180
4250                                32,3374  77850 1                GOTO
4251  REP  1                        32,3375  65437 1                       V2T185

R4252  CONIC TRAJECTORY COMPUTATION

4253                                32,3376  53145 1  V2T180  DLOAD  BZE
4254  REP  7  LAST  874             32,3377  03722 0                       X(T1)
4255  REP  1                        32,3400  65404 1                       V2T185
4256                                32,3401  52040 1                BMN    GOTO
4257  REP  2  LAST  874             32,3402  85404 1                       V2T165
4258  REP  1                        32,3403  65474 0                       V2T300
4259                                32,3404  53145 1  V2T185  DLOAD  BZE
4260  REP  4  LAST  872             32,3405  03757 1                       CPPA
4261  REP  2  LAST  874             32,3406  65474 0                       V2T300
4262                                32,3407  71240 1                BMN    DLOAD
4263  REP  3  LAST  874             32,3410  85474 0                       V2T300
4264                                32,3411  00017 1                       14D
```

X(T1)LIM = X(T1)MIN

PL16D

-X(T1)LIM = X(T1)MAX

X(T1)MIN = X(T1)

DX(T1)MAX = DX(T1) PL18D

X(T1)MAX = X(T1)

-DX(T1)MAX = DX(T1) PL18D
GOTO X(T1)-DV ITERATOR

EXIT IF MINIMUM FUEL MODE

```
4265  REF  8  LAST  874   32,3412  17722 0          STODL  X(T1)        X(T1)MAX=X(T1)
4266                      32,3413  00015 0                 12D
4267                      32,3414  77878 0          DCOMP
4268                      32,3415  34021 0          STCALL 16D          -DX(T1)MAX=DX(T1)
4269  REF  2  LAST  874   32,3416  65500 1                 GAMDV10
4270                      32,3417  45345 1          DLOAD  DSU
4271  REF  7  LAST  874   32,3420  03832 0                 RTEDVD
4272  REF  4  LAST  874   32,3421  03706 0                 DV
4273                      32,3422  77640 0          BMN
4274  REF  4  LAST  874   32,3423  65474 0                 V2T300
4279                      32,3424  71214 0  V2T175  SET    DLOAD
4280  REF  2  LAST  871   32,3425  00072 1                 P2RTE
4281  REF  9  LAST  875   32,3426  03722 0                 X(T1)
4282                      32,3427  14017 1          STODL  14D          X(T1)=X(T1)MAX
4283                      32,3430  00015 0                 12D
4284                      32,3431  77878 0          DCOMP
4285                      32,3432  34021 0          STCALL 16D          -DX(T1)MAX=DX(T1)
4286  REF  3  LAST  875   32,3433  65500 1                 GAMDV10
4287                      32,3434  50145 1          DLOAD  BMN
42875 REF 13  LAST  874   32,3435  03730 0                 NN1A
4288  REF  5  LAST  875   32,3436  85474 0                 V2T300
```

R42885 PREVENT A LARGE CHANGE IN INDEPENDENT VARIABLE DURING AN ITERATION FOR A
R428851 PRECISION TRAJECTORY

```
4289                      32,3437  45345 1  V2T185  DLOAD  DSU
4290  REF 10  LAST  875   32,3440  03722 0                 X(T1)
4291                      32,3441  00001 0                 00D
4292                      32,3442  65248 1          ABS    PDDL         /X(T1)-X(T1),,/ = BETA7
4293                      32,3443  00015 0                 12D
4294                      32,3444  44352 0          SL1    BDSU
4295                      32,3445  71240 1          BMN    DLOAD
4298  REF  6  LAST  875   32,3446  65474 0                 V2T300
4297                      32,3447  00001 0                 00D          CONTINUE IF BETA7 LARGER THAN 2DX(T1)MAX
4298  REF 11  LAST  875   32,3450  03722 0          STORE  X(T1)        X(T1),, = X(T1)
4299                      32,3451  50025 0          DSU    BMN
4300                      32,3452  00017 1                 14D
4301  REF  1              32,3453  85481 1                 V2T195
4302                      32,3454  77745 1          DLOAD
4303                      32,3455  00017 1                 14D
4304  REF 12  LAST  875   32,3456  03722 0          STORE  X(T1)        X(T1)MAX = X(T1)
4305                      32,3457  77650 1          GOTO
4306  REF  1              32,3460  85472 0                 V2T205
4307                      32,3461  45345 1  V2T195  DLOAD  DSU
4308  REF 13  LAST  875   32,3462  03722 0                 X(T1)
4309                      32,3463  00013 0                 10D
4310                      32,3464  52040 1          BMN    GOTO
4311  REF  1              32,3465  65467 1                 V2T200
4312  REF  2  LAST  875   32,3466  65472 0                 V2T205
4313                      32,3467  77745 1  V2T200  DLOAD
```

```
4314
4315  REF  14  LAST  875     32,3470  00013 0                    10D
4316                         32,3471  03722 0          STORE     X(T1)
4317  REF   1               32,3472  77624 1  V2T205  CALL
4318                         32,3473  65701 1                    DVCALC
4319  REF   5  LAST  866     32,3474  77745 1  V2T300  DLOAD
4320                         32,3475  31677 0                    ZERORTE
4321                         32,3476  77650 1  V2T1X    GOTO
                             32,3477  00041 1                    33D
```

X(T1)MIN = X(T1)

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P4400   X(T1)-DV ITERATOR SUBROUTINE

R4401   DESCRIPTION
R4402       COMPUTES A POST IMPULSE VELOCITY VECTOR (V2(T1)) WHICH REQUIRES A MINIMUM DV.
R4404   CALLING SEQUENCE
R4405     L       CALL
R4406     L+1             GAMDV10

R4407   NORMAL EXIT MODE
R4410     AT L+2 OF CALLING SEQUENCE

R4411   ALARM EXIT MODE
R4412     AT V2T1X WITH MPAC = OCTAL 605 FOR EXCESS-ITERATIONS

R4413   SUBROUTINES CALLED
R4414     DVCALC

R4415   ERASABLE INITIALIZATION REQUIRED
R4416     PUSHLIST
R4417       02D         THETA1=BETA5*LAMBDA-1                          TP      B17
R4419       05D         THETA2=2*R(T1)*(LAMBDA-1)                      TP      B38/B36
R4421       08D         THETA3=MU**.5/R(T1)                            DP      B-4/B-5
R4423       10D         X(T1)MIN=LOWER BOUND ON INDEPENDENT VARIABLE X(T1)   DP      B5
R4425       12D         DX(T1)MAX=MAXIMUM DX(T1)                       DP      B5
R4427       14D         X(T1)MAX=UPPER BOUND ON INDEPENDENT VARIABLE X(T1)   DP      B5
R4429       16D         DX(T1)=ITERATOR INCREMENT                      DP      B5
R4431     MPAC
R4432       NONE
R4433     OTHER
R4434       V(T1)/      INITIAL VELOCITY VECTOR                        VECTOR  B7/B5   METERS/CS
R4436       RTEDVD      DELTA VELOCITY DESIRED                         DP      B7/B5   METERS/CS
R4438       UR1/        UNIT INITIAL VECTOR                            VECTOR  B1
R4440       UH/         UNIT HORIZONTAL VECTOR                         VECTOR  B1
R4442       X(T1)       COTANGENT OF INITIAL FLIGHT PATH ANGLE (FROM VERTICAL)  DP      B5
R4444       F2RTE       TIME CRITICAL OR MINIMUM FUEL MODE INDICATOR   STATE AREA      0 MIN. FUEL, 1 MIN. TIME
R4446
R4447   OUTPUT
R4448       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR           VECTOR  B7/B5   METERS/CS
R4450       DV          INITIAL VELOCITY CHANGE                        DP      B7/B5   METERS/CS
R4452       X(T1)       COTANGENT OF INITIAL FPA MEASURED FROM VERTICAL DP      B5
R4454       PCON        SEMI-LATUS RECTUM                              DP      B28/B26 METERS
R4456
R4457   DEBRIS
R4458     PUSHLIST
R4459       00D         X(T1),,
R4462       02D         THETA1
R4463       05D         THETA2
R4464       08D         THETA3
R4465       10D         X(T1)MIN
R4466       12D         DX(T1)MAX
```

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```
R4467    14D      X(T1)MAX
R4468    16D      DX(T1)
R4473    22D      DV,=PREVIOUS DV
R4475    24D      BETA9=X(T1)+1.1DX(T1)
R4477    31D      GAMDV10 SUBROUTINE RETURN ADDRESS
R4478    32D      DVCALC SUBROUTINE RETURN ADDRESS
R4479    33D      VZT100 SUBROUTINE RETURN ADDRESS
 4490
 4491                    32,3500   77620 0  GAMDV10  STQ
 4500                    32,3501   00037 0           31D
 4501                    32,3502   45001 1  SETPD    CALL
 4502 REF  2 LAST 878    32,3503   00023 0           18D
 4503                    32,3504   65701 1           DVCALC
 4504                    32,3505   45345 1  DLOAD    DSU
 4505                    32,3506   00017 1           14D
 4508                    32,3507   00013 0           10D
 4507 REF  1             32,3510   77600 1  BOV
 4508                    32,3511   65531 0           GAMDV20
 4509 REF  1             32,3512   45206 1  PUSH     DSU
 4510                    32,3513   31772 1           EPC9RTB
 4511 REF  1             32,3514   71240 1  BMN      DLOAD
 4512                    32,3515   65677 1           GAMDVX
 4513                    32,3518   00023 0           18D
 4514                    32,3517   50025 0  DSU      BMN
 4515 REF  1             32,3520   00015 0           12D
 4516                    32,3521   65525 0           GAMDV15
 4517                    32,3522   52001 1  SETPD    GOTO
45175 REF  2 LAST 876    32,3523   00023 0           18D
 4516                    32,3524   65531 0           GAMDV20
 4519                    32,3525   77745 1  GAMDV15  DLOAD
 4520                    32,3526   70565 0  SIGN     SR1
 4521                    32,3527   00021 1           16D
 4522                    32,3530   00021 1  STORE    16D
 4523 REF  1             32,3531   77745 1  GAMDV20  DLOAD
 4524 REF  6 LAST 663    32,3532   31701 0           M144RTB
 4525                    32,3533   03732 1  STORE    NN2
 4526 REF  7 LAST 876    32,3534   43345 1  GAMDV25  DLOAD   DAD
 4527 REF  4 LAST 665    32,3535   03732 1           NN2
 4528                    32,3538   31675 1           1RTEB28
 4529 REF  1             32,3537   67240 0  BMN      SLOAD
 4530 REF  3 LAST 862    32,3540   85544 1           GAMDV30
 4531                    32,3541   31735 1           OCT505
 4532 REF  2 LAST 874    32,3542   77850 1  GOTO
 4533 REF  8 LAST 878    32,3543   85478 1           V2T1X
 4534                    32,3544   03732 1  GAMDV30  STORE   NN2
 4535 REF 15 LAST 878    32,3545   65345 0           DLOAD   PDDL
 4538 REF  5 LAST 875    32,3548   03722 0                   X(T1)
 4537                    32,3547   03708 0                   DV
 4538 REF 16 LAST 878    32,3550   43325 1           PDDL    DAD
 4539                    32,3551   03722 0                   X(T1)
                         32,3552   00021 1                   18D
```

```
DP      B7/B5
DP      B5

                                                          PL18D

X(T1)MAX-X(T1)MIN=BETA8                          B5 PL20D

BOUNDS CLOSE TOGETHER

BETA6-DX(T1)MAX

                                                          PL18D

                                                          PL18D

BETA6(SIGNDX(T1))/2=DX(T1)

NN2=NN2+1
X(T1)=X(T1),                                     B5 PL20D

DV=DV,                                        B7/B5 PL22D
```

```
 4540   REF  17  LAST  878   32,3553  37722 1          STCALL X(T1)      X(T1)+DX(T1)=X(T1)                B5
 4541   REF   3  LAST  878   32,3554  65701 1                 DVCALC
 4542                        32,3555  71214 0          BON    DLOAD
 4543   REF   3  LAST  875   32,3556  00312 1                 P2RTE
 4544   REF   1               32,3557  85573 0                 GAMDV35
 4545   REF   6  LAST  878   32,3560  03708 0                 DV
 4546                        32,3561  50025 0          DSU    BMN               CONTINUE IF FUEL CRITICAL MODE
 4547                        32,3562  00025 0                 20D
 4548   REF   1               32,3563  65570 0                 GAMDV33
 4549                        32,3564  57545 1  GAMDV32 DLOAD  DCOMP
 4550                        32,3565  00021 1                 16D
 4551                        32,3566  77742 0          SR1
 4552                        32,3567  00021 1          STORE  16D
 4553                        32,3570  52001 1  GAMDV33 SETPD  GOTO
 4554                        32,3571  00023 0                 18D                                             PL18D
 4555   REF   1               32,3572  65838 1                 GAMDV50

R4556   TIME CRITICAL MODE

 4557                        32,3573  45345 1  GAMDV35 DLOAD  DSU
 4558   REF   8  LAST  875   32,3574  03832 0                 RTEDVD
 4559   REF   7  LAST  879   32,3575  03708 0                 DV
 4560                        32,3576  41525 0          PDDL   PUSH              DVD-DV=DVERR                    B7/B5 PL22D
 4561                        32,3577  51545 1  GAMDV40 DLOAD  ABS               DV,                                PL24D
 4562                        32,3600  00025 0                 20D
 4563                        32,3601  50025 0          DSU    BMN
 4564   REF   1               32,3602  31774 1                 EPC10RTE
 4565   REF   2  LAST  878   32,3603  85877 1                 GAMDVX
 4566                        32,3604  71204 1  GAMDV45 BOVB   DLOAD
45861   REF   8  LAST  826   32,3605  57343 1                 TCDANZIG          ASSURE OVFIND IS 0
 4567                        32,3606  60221 0          BDSU   NORM
 4568   REF   8  LAST  879   32,3607  03708 0                 DV
 4569   REF  19  LAST  872   32,3610  00050 1                 X2
 4570                        32,3611  77725 1          PDDL                    DV-DV,                    B7/B5-N2 PL22D
 4571                        32,3612  70501 1          NORM   SR1              DVERR                     B8/B6-N1
 4572   REF  43  LAST  871   32,3613  00047 1                 X1
 4573                        32,3614  85271 0          DDV    PDDL              DVERR/ DV - DV
 4578                        32,3615  41221 0          BDSU   DMP                                              PL18D
 4577   REF  18  LAST  879   32,3616  03722 0                 X(T1)
 4578                        32,3617  77680 1          XSU,1
 4579   REF  20  LAST  879   32,3620  00047 1                 X2
45791                        32,3621  00021 1          STORE  18D               PRESERVE SIGN IF OVERFLOW
45792                        32,3622  40057 1          SR*    BOV
 4580                        32,3623  20800 0                 0 -1,1
45801   REF   1               32,3624  85832 0                 GAMDV47
 4581                        32,3625  00021 1          STORE  18D               (X(T1)-X(T1),)DVERR/(DV-DV,)=DX(T1)
 4582                        32,3626  45248 0          ABS    DSU
 4583                        32,3627  00015 0                 12D
 4584                        32,3630  77640 0          BMN
 4585   REF   2  LAST  679   32,3631  65636 1                 GAMDV50
```

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```
4586                                32,3632  75345 1  GAMDV47  DLOAD   SIGN
4587                                32,3633  00015 0                   12D
4588                                32,3634  00021 1                   16D
4589                                32,3635  00021 1           STORE   16D          DX(T1)MAX(SIGNDX(T1))=DX(T1)

R4590  CHECK TO KEEP INDEPENDENT VARIABLE IN BOUNDS

4591                                32,3636  41345 0  GAMDV50  DLOAD   DMP
4592                                32,3637  00021 1                   16D
4593   REP   1                     32,3640  31711 1                   1.1RTEB1
4594                                32,3641  43352 1           SL1     DAD
4595   REP  19  LAST  679          32,3642  03722 0                   X(T1)
4596                                32,3643  00031 0           STORE   24D          X(T1)+1.1DX(T1)=BETA9          B5
4597                                32,3644  50025 0           DSU     BMN
4598                                32,3645  00017 1                   14D
4599   REP   1                     32,3646  65655 1                   GAMDV55
4600                                32,3647  45345 1           DLOAD   DSU
4601                                32,3650  00017 1                   14D
4602   REP  20  LAST  660          32,3651  03722 0                   X(T1)
4603                                32,3652  77742 0           SR1
4604                                32,3653  34021 0           STCALL  16D          (X(T1)MAX-X(T1))/2=DX(T1)      B5
4605   REP   1                     32,3654  65670 0                   GAMDV65
4606                                32,3655  45345 1  GAMDV55  DLOAD   DSU
4607                                32,3656  00031 0                   24D
4608                                32,3657  00013 0                   10D
4609                                32,3660  52040 1           BMN     GOTO
4610   REP   1                     32,3661  65663 1                   GAMDV60
4611   REP   2  LAST  860          32,3662  65670 0                   GAMDV65
4612                                32,3663  45345 1  GAMDV60  DLOAD   DSU
4613                                32,3664  00013 0                   10D
4614   REP  21  LAST  660          32,3665  03722 0                   X(T1)
4615                                32,3666  77742 0           SR1
4616                                32,3667  00021 1           STORE   16D          (X(T1)MIN-X(T1))/2=DX(T1)      B5
4617                                32,3670  51545 1  GAMDV65  DLOAD   ABS
4618                                32,3671  00021 1                   16D
4619                                32,3672  50025 0           DSU     BMN
4620   REP   2  LAST  876          32,3673  31772 1                   EPC9RTE
4621   REP   3  LAST  679          32,3674  65677 1                   GAMDVX
4622                                32,3675  77650 1           GOTO
4623   REP   1                     32,3676  65534 0                   GAMDV25
4624                                32,3677  77650 1  GAMDVX   GOTO
4625                                32,3700  00037 0                   31D
```

```
P4700   DV CALCULATION SUBROUTINE

R4701   INPUT
R4702     PUSHLIST
R4703       02D         THETA1=BETA5*LAMBDA-1                                   TP      B17
R4705       05D         THETA2=2*R(T1)*(LAMBDA-1)                               TP      B38/B36
R4707       08D         THETA3=MU**.5/R(T1)                                     DP      B-4/B-5
R4709     OTHER
R4710       X(T1)       COTANGENT OF POST IMPULSE INITIAL FLIGHT PATH ANGLE     DP      B5
R4712       V(T1)/      INITIAL VELOCITY VECTOR (PRE IMPULSE)                   VECTOR  B7/B5   METERS/CS
R4714       UR1/        UNIT INITIAL VECTOR                                     VECTOR  B1
R4716       UH/         UNIT HORIZONTAL VECTOR                                  VECTOR  B1
R4716
R4719   OUTPUT
R4720       V2(T1)/     POST IMPULSE INITIAL VELOCITY VECTOR                    VECTOR  B7/B5   METERS/CS
R4722       DV          INITIAL VELOCITY CHANGE                                 DP      B7/B5   METERS/CS
R4724       PCON        SEMI-LATUS RECTUM                                       DP      B28/B26 METERS
R4726
R4727   DEBRIS
R4726       28D         THETA3*PCON**.5                                         DP      B10/B8-N1
R4730       C(PUSLOC)   THETA3(PCON**.5)*X(T1)*UR1/                             VECTOR  B7/B5
R4732       32D         DVCALC SUBROUTINE RETURN ADDRESS
R4733       X1          NORMALIZATION FACTOR FOR VALUE IN 28D

R4734   PUSHLOC IS RESTORED TO ITS ENTRANCE VALUE UPON EXITING DVCALC

 4750                           32,3701  71220 1  DVCALC   STQ     DLOAD
 4751                           32,3702  00040 0           32D
 4752   REF  22  LAST  860      32,3703  03722 0           X(T1)
 4753                           32,3704  54316 1  DSQ      SR
 4754                           32,3705  20610 1           7
 4755                           32,3706  76276 0  DCOMP    TAD
 4756                           32,3707  00003 1           02D
 4757                           32,3710  41501 0  NORM     PUSH
 4758   REF  44  LAST  679      32,3711  00047 1           X1
 4759                           32,3712  60351 0  TLOAD    NORM
 4760                           32,3713  00006 1           05D
 4761   REF  21  LAST  879      32,3714  00050 1           X2
 4762                           32,3715  70434 0  RTB      SR1
47625   REF   3  LAST  673      32,3716  45713 0           DPMODE
476251                         32,3717  56264 1  XSU,2    DDV
 4763   REF  45  LAST  881      32,3720  00046 0           X1
47635                          32,3721  77657 0  SR*
476351                         32,3722  57170 0           6,2
 4764   REF   3  LAST  647      32,3723  03720 1  STORE    PCON    THETA2/(THETA1-X(T1)**2)=PCON B28/26
 4765                           32,3724  41366 1  SQRT     DMP
 4766                           32,3725  00011 1           08D
 4767                           32,3726  77701 1  NORM
 4768   REF  46  LAST  681      32,3727  00047 1           X1
 4769                           32,3730  14035 1  STODL    28D     THETA3*PCON**.5         B10/B8 -N1
```

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```
4770  REF  23  LAST  881    32,3731  03722 0          X(T1)
4771                        32,3732  74301 0  NORM    VXSC
4772  REF  22  LAST  881    32,3733  00050 1          X2
4773  REF   8  LAST  659    32,3734  03740 1          UR1/
4774                        32,3735  74274 0  XAD,2   VXSC
4775  REF  47  LAST  881    32,3738  00046 0          X1
4776                        32,3737  00035 1          28D
4777                        32,3740  63257 1  VSR*    PDVL
4778                        32,3741  57207 0          0 -9D,2
4779  REF   5  LAST  859    32,3742  03746 1          UH/
4780                        32,3743  53781 1  VXSC    VSR*
4781                        32,3744  00035 1          28D
4782                        32,3745  20575 1          0 -4,1
4783                        32,3746  45455 1  VAD     STADR
4784  REF   7  LAST  888    32,3747  74077 1  STORE   V2(T1)/
4785                        32,3750  51451 0  VSU     ABVAL
4786  REF   6  LAST  859    32,3751  03672 1          V(T1)/
4787  REF   9  LAST  879    32,3752  03706 0  STORE   DV
4788                        32,3753  77650 1  GOTO
4789                        32,3754  00040 0          32D
```

X(T1)*UR1/ B5+B1 -N2

THETA3(PCON**.5)X(T1)*UR1/ B7/B5
+
THETA3(PCON**.5)UH/ B7/B5
=
V2(T1)/ B7/B5

ABVAL(V2(T1)/-V1(T)/)=DV B7/B5

```
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P4800   SUBROUTINE TO COMPUTE BOUNDS ON INDEPENDENT VARIABLE X(T1)

R4801   INPUT
R4802     PUSHLIST
R4803       PUSHLOC -4  MAJOR AXIS (MA)                                  DP      B30/B28
R4805       PUSHLOC -2  MAJOR AXIS (MA) AGAIN                            DP      B30/B28
R4807       28D         BETA5=LAMBDA*BETA1                               DP      B9
R4809     OTHER
R4810       RCON                                                         DP      B29/B27
R4812       R(T1)                                                        DP      B29/B27
R4814   OUTPUT
R4815     MPAC
R4816       X(T1)LIM    LIMIT ON INDEPENDENT VARIABLE X(T1)              DP      B5
R4818   DEBRIS
R4819     PUSHLIST
R4820       C(PUSHLOC)  MA-RCON                                          DP      (B30/28)-N1
R4823       C(PSHLOC)+2 MA                                               DP      B30/B28
R4825       X1          NORMALIZATION FACTOR FOR MA-RCON
R4828       20D         XT1LIM SUBROUTINE RETURN ADDRESS
R4827   PUSHLOC IS RESTORED TO ITS ENTRANCE VALUE UPON EXITING XT1LIM

 4848   REF   1             27,2000                        SETLOC  RTE2
 4849                       27,2833                        BANK
 4850                       27,2833  71220 1  XT1LIM       STQ     DLOAD
 4851                       27,2834  00024 1               20D
 4852   REF  12  LAST  871  27,2835  03838 1               RCON
 4853                       27,2838  44342 1               SR1     BDSU
 4854                       27,2837  65301 0               NORM    PDDL    MA-RCON                 B30-N1
 4855   REF  23  LAST  882  27,2840  00050 1               X2
 4856                       27,2841  70525 1               PDDL    SR1
 4857   REF   7  LAST  872  27,2842  03648 0               R(T1)
 4858                       27,2843  58221 0               BDSU    DDV
 4859                       27,2844  41257 1               SL*     DMP
 4880                       27,2845  57577 0                       0 -1,2
 4861                       27,2848  00035 1                       28D
 48815                      27,2847  77657 0               SL*
 488151                     27,2850  20172 1                       0 -7,1
 4882                       27,2651  50025 0               DSU     BMN     (BETA5(MA-R(T1))/(MA-RCON))-1  B10
 4863   REF   1             27,2652  31663 0                       1RTEB10
 4864   REF   1             27,2653  56656 1                       XT1LIM5
 4865                       27,2654  52166 1               SQRT    GOTO
 4866   REF   1             27,2655  56660 1                       XT1LIMX
 4867                       27,2656  77745 1  XT1LIM5      DLOAD
 4866   REF   6  LAST  876  27,2657  31677 0                       ZERORTE
 4869                       27,2660  77650 1  XT1LIMX      GOTO
 4870                       27,2661  00024 1                       20D
```

P4900 CONSTANTS FOR THE P37 AND P70 PROGRAMS AND SUBROUTINES

```
49005
49006  REF  1          36,3250                    BANK    36
49007                  34,2000                    SETLOC  RTECON
                       34,3652                    BANK

4901
4901                   34,3652  20000 0  1RTEB1    2DEC    1.B-1
4902                   34,3653  00000 1
4902                   34,3654  10000 0  1RTEB2    2DEC    1.B-2
4903                   34,3655  00000 1
4903                   34,3656  04000 0  1RTEB3    2DEC    1.B-3
4904                   34,3657  00000 1
4904                   34,3660  02000 0  1RTEB4    2DEC    1.B-4
4910                   34,3661  00000 1
4910                   34,3662  00020 0  1RTEB10   2DEC    1.B-10
4912                   34,3663  00000 1
4912                   34,3664  00004 0  1RTEB12   2DEC    1.B-12
4913                   34,3665  00000 1
4913                   34,3666  00002 0  1RTEB13   2DEC    1.B-13
4917                   34,3667  00000 1
4917                   34,3670  00000 1  1RTEB17   2DEC    1.B-17
4925                   34,3671  04000 0
4925                   34,3672  00000 1  1RTEB25   2DEC    1.B-25
4928                   34,3673  00010 0
4928                   34,3674  00000 1  1RTEB28   2DEC    1.B-28
4929                   34,3675  00001 0
4929                   34,3676  00000 1  ZERORTE   2DEC    0
4930                   34,3677  00000 1
4930                   34,3700  77777 0  M144RTE   2DEC    -144.B-28
49301                  34,3701  77557 0
49301                  34,3702  77777 0  M15RTE    2DEC    -15
49302                  34,3703  77760 0
49302                  34,3704  00000 1  10RTE     2DEC    10
49303                  34,3705  00012 1
49303                  34,3706  54631 1  M.6RTE    2DEC    -.6
4931                   34,3707  63145 1
4931                   34,3710  21463 0  1.1RTEB1  2DEC    1.1B-1
49311                  34,3711  06315 0
49311                  34,3712  77777 0  M6RTEB28  2DEC    -6
49312                  34,3713  77771 0
49312                  34,3714  37777 1  2RTEB1    2OCT    3777737777
4932                   34,3715  37777 1
4932                   34,3716  77777 0  M9RTEB28  2DEC    -9
4933                   34,3717  77766 0
4933                   34,3720  77777 0  M8RTEB28  2DEC    -8
4934                   34,3721  77767 1
4934                   34,3722  00000 1  30480RTE  2DEC    30480.B-29
4935                   34,3723  35610 0
4935                   34,3724  36703 0  VCSPS     2DEC    30.8811B-5
                       34,3725  03743 1
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4936                    34,3726   33041 1  VCRCS    2DEC    27.0664B-5
4936                    34,3727   37714 1
4937                    34,3730   00003 1  MDOTRCS  2DEC    .0016375B-3
4937                    34,3731   13241 1
4938                    34,3732   20000 0  CSUBT    2DEC    .5
4938                    34,3733   00000 1
4940                    34,3734   00605 1  OCT605   OCT     00605
4941                    34,3735   00612 1  OCT612   OCT     00612
4942                    34,3736   00613 0  OCT613   OCT     00613
4943                    34,3737   40214 1  MCOS7.5  2DEC    -.99144486
4943                    34,3740   45266 1
4944                    34,3741   73645 1  MSIN7.5  2DEC    -.13052619
4944                    34,3742   56536 1
4945                    34,3743   70467 0  MCOS22.5 2DEC    -.92367953B-2
4945                    34,3744   71205 0
4946                    34,3745   16525 1  THETA165 2DEC    .456333333
4946                    34,3746   12525 0
4947                    34,3747   22525 0  THETA210 2DEC    .563333333
4947                    34,3750   12525 0
4951                    34,3751   17775 1  EPC1RTE  2DEC    .99966B-1
4951                    34,3752   06676 0
4952                    34,3753   00000 1  EPC2RTE  2DEC    100.B-29
4952                    34,3754   00062 0
4953                    34,3755   00020 0  EPC3RTE  2DEC    .001
4953                    34,3756   14223 1
4954                    34,3757   00000 1  EPC4RTE  2DEC    .00001
4954                    34,3760   05174 0
4955                    34,3761   00002 0  EPC5RTE  2DEC    .01B-6
4955                    34,3762   21727 0
4956                    34,3763   00000 1  EPC6RTE  2DEC    .000007B-1
4956                    34,3764   01654 1
4957                    34,3765   00000 1  EPC7RTE  2DEC    1000.B-29
4957                    34,3766   00764 1
4956                    34,3767   00040 0  EPC8RTE  2DEC    .002
4956                    34,3770   30447 0
4959                    34,3771   00000 1  EPC9RTE  2DEC    1.B-25
4959                    34,3772   00010 0
4960                    34,3773   00000 1  EPC10RTE 2DEC    .0001B-7
4960                    34,3774   00322 1
4961                    35,3755            BANK     35
4962  REF   1           35,2000            SETLOC   RTECON1
4963                    35,3755            BANK
4964                    35,3755   27657 0  C4RTE    2DEC    6.E8B-30
4964                    35,3756   01000 0
4971                    35,3757   00325 0  K1RTE    2DEC    7.E6B-29
4971                    35,3760   23740 0
4972                    35,3761   00306 1  K2RTE    2DEC    6495000.B-29
4972                    35,3762   06614 1
4973                    35,3763   76027 0  K3RTE    2DEC    -.06105
4973                    35,3764   70156 1
```

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4974
4974                35,3765  74517 1  K4RTE    2DEC   -.10453
                    35,3766  54131 0
4980
4980                35,3767  30276 1  RTMURTE  2DEC   199650.501B-18
                    35,3770  05001 0
4995
4995                35,3771  00003 1  E3RTE    2DEC   121920.B-29
                    35,3772  27040 0
```

```
2000                          23,3140                          BANK    23
2001  REF  1                  42,2000                          SETLOC  SBAND
2002                          42,3565                          BANK

2003  REF  1                                                   COUNT*  $$/R05
2004  REF  3  LAST  762       E4,1417                          EBANK=  EMSALT

20061 REF 238  LAST  853      42,3565  0 4555 0  SBANDANT TC      BANKCALL      V 64 E GETS US HERE
20082 REF  8  LAST  757       42,3586   17573 0          CADR    R02BOTH       CHECK IF IMU IS ON AND ALIGNED
2007  REF 221  LAST  853      42,3587  0 6006 1          TC      INTPRET
2008                          42,3570   45034 1          RTB     CALL
2009  REF  24  LAST  744      42,3571   45505 0                  LOADTIME      PICKUP CURRENT TIME SCALED B-28
2010  REF   9  LAST  731      42,3572   47432 1                  CDUTRIG       COMPUTE SINES AND COSINES OF CDU ANGLES
2012  REF  46  LAST  868      42,3573   34041 0          STCALL  TDEC1         ADVANCE INTEGRATION TO TIME IN TDEC1
2013  REF   9  LAST  734      42,3574   27045 0                  CSMCONIC      USING CONIC INTEGRATION
2014                          42,3575   46135 1          SLOAD   BHIZ           ORIGIN OF REFERENCE INERTIAL SYSTEM IS
2015  REF  24  LAST  883      42,3578   00050 1                  X2            EARTH = 0, MOON = 2
2016  REF  1                  42,3577   65812 1                  EISOI
2017                          42,3600   77775 1          VLOAD
2018  REF  35  LAST  889      42,3601   00001 0                  RATT
2019  REF  1                  42,3602   00003 1          STORE   RCM           MOVE RATT TO PREVENT WIPEOUT
2020                          42,3603   45145 0          DLOAD   CALL          MOON, PUSH ON
2021  REF   9  LAST  889      42,3604   00015 0                  TAT           GET ORIGINAL TIME
2022  REF  1                  42,3605   54115 0                  LUNPOS        COMPUTE POSITION VECTOR OF MOON
2023                          42,3606   57455 1          VAD     VCOMP         R= -(REM+RCM) = NEG. OF S/C POS. VEC
2024  REF  2  LAST  887       42,3607   00003 1                  RCM
2025                          42,3610   77650 1          GOTO
2026  REF  2  LAST  887       42,3611   65614 1                  EISOI +2
2027                          42,3612   57575 1  EISOI   VLOAD   VCOMP         EARTH, R= -RCM
2028  REF  36  LAST  887       42,3613   00001 0                  RATT
2029                          42,3614   64201 0          SETPD   MXV           RCS TO STABLE MEMBER- B-1X B-29X B+1
2030                          42,3615   00003 1                  2D            2D
2031  REF  35  LAST  838       42,3616   01738 1                  REFSMMAT      STABLE MEMBER.  B-1X B-29X B+1= B-29
2032                          42,3617   65372 1          VSL1    PDDL          8D
2033  REF  24  LAST  833       42,3620   15332 1                  HI8ZEROS
2034  REF  1                  42,3621   24025 0          STOVL   YAWANG        ZERO OUT YAWANG, SET UP FOR SMNB
2035  REF  3  LAST  887       42,3622   00003 1                  RCM           TRANSFORMATION. SM COORD. SCALED B-29
2036                          42,3623   77624 1          CALL
2037  REF  5  LAST  677       42,3624   47577 1                  *SMNB*
2038  REF  1                  42,3625   00003 1          STORE   R             SAVE NAV. BASE COORDINATES
2039                          42,3626   63258 0          UNIT    PDVL          14D
2040  REF  2  LAST  887       42,3627   00003 1                  R
2041                          42,3630   72431 1          VPROJ   VSL2          COMPUTE PROJECTION OF VECTOR INTO CM
2042  REF  2  LAST  281       42,3631   15324 0                  HIUNITZ       XY-PLANE, R-(R.UZ)UZ
2043                          42,3632   40045 1          BVSU    BOV           CLEAR OVERFLOW INDICATOR IF SET
2044  REF  3  LAST  887       42,3633   00003 1                  R
2045  REF  1                  42,3634   85835 1                  COVCNV
2046                          42,3635   40056 0  COVCNV  UNIT    BOV           TEST OVERFLOW FOR INDICATION OF NULL
2047  REF  1                  42,3636   65652 0                  NOADJUST      VECTOR
2048                          42,3637   50206 0          PUSH    DOT           20D
```

L S-BAND ANTENNA FOR CM

USER=S PAGE NO. 2 E4 S4

```
2049  REP  4  LAST  389    42,3640  15330 0                  HIUNITX
2050                       42,3641  65552 0          SL1     ACOS
2051                       42,3642  50315 0          PDVL    DOT
2052  REP  1               42,3643  00017 1                  URP
2053  REP  2  LAST  281    42,3644  15326 1                  HIUNITY
2054                       42,3645  51152 0          SL1     BPL
2055  REP  2  LAST  887    42,3646  65652 0                  NOADJUST
2056                       42,3647  45345 1          DLOAD   DSU
2057  REP 10  LAST  624    42,3650  15340 1                  DPPOSMAX
2058                       42,3651  77606 1          PUSH
2059                       42,3652  50375 0  NOADJUST VLOAD  DOT
2060  REP  1               42,3653  00011 1                  UR
2061  REP  3  LAST  887    42,3654  15324 0                  HIUNITZ
2062                       42,3655  65552 0          SL1     ACOS
2063                       42,3656  77625 0          DSU
2064  REP  3  LAST  835    42,3657  15322 0                  HIDP1/4
2065  REP  4  LAST  275    42,3660  16321 0          STODL   RHOSB
2066  REP  2  LAST  887    42,3661  00025 0                  YAWANG
2067  REP  2  LAST  275    42,3662  02323 1          STORE   GAMMASB
2068                       42,3663  77776 1          EXIT
20681 REP 19  LAST  743    42,3664  3 1044 0         CA      EXTVRACT
20682 REP 32  LAST  700    42,3665  7 4706 0         MASK    BIT5
20683                      42,3666  0 0006 1         EXTEND
20684 REP 32  LAST  624    42,3667  1 5423 0         BZF     ENDEXT
2069  REP  1               42,3670  3 3704 1         CAF     V06N51
2070  REP 239 LAST  887    42,3671  0 4555 0         TC      BANKCALL
2071  REP  3  LAST  561    42,3672   20504 1         CADR    GOMARKPR
2072  REP  7  LAST  510    42,3673  0 5514 1         TC      B5OFF
2073  REP  8  LAST  888    42,3674  0 5514 1         TC      B5OFF
2074  REP 102 LAST  851    42,3675  0 5112 0         TC      ENDOFJOB
2075  REP 25  LAST  692    42,3676  3 4710 0         CAF     BIT3
2076  REP 16  LAST  851    42,3677  0 5415 1         TC      BLANKET
2077  REP 60  LAST  779    42,3700  3 4712 1         CAF     BIT1
2078  REP 240 LAST  888    42,3701  0 4555 0         TC      BANKCALL
2079  REP 12  LAST  759    42,3702   01732 0         CADR    DELAYJOB
2080  REP  2  LAST  244    42,3703  1 3567 1         TCF     SBANDANT +2
2086                       42,3704   01463 1 V06N51  VN      0651
2087                         0002          RCM     EQUALS  2D
2088                         0010          UR      EQUALS  8D
2089                         0016          URP     EQUALS  14D
2090                         0024          YAWANG  EQUALS  20D
2091                         0026          PITCHANG EQUALS 22D
2092  REP  4  LAST  887      0002          R       EQUALS  RCM
```

```
COMPUTE YAW ANGLE = ACOS (URP.UX)
REVOLUTIONS SCALED B0
22D YAWANG

COMPUTE FOLLOWING- URP.UY
POSITIVE
YES, 0- 180 DEGREES
NO, 181-360 DEGREES 20D
COMPUTE 2 PI MINUS YAW ANGLE
22D YAWANG
COMPUTE PITCH ANGLE
ACOS (UR.UZ) - PI/2

REVOLUTIONS B0



PATCH FOR CHECKOUT

IS BIT 5 STILL ON


NO, WE HAVE BEEN ANSWERED
DISPLAY ANGLES


TERMINATE

RECYCLE
IMMEDIATE RETURN
BLANK R3
DELAY MINIMUM TIME TO ALLOW DISPLAY IN
```

```
0001                          31,3215                    BANK   31
0002  REF   1                 31,2000                    SETLOC R35
0003                          31,3215                    BANK

0004  REF   1                                            COUNT  31/R35

0005  REF   2  LAST   88      E4,1724                    EBANK= JLOOPCNT
0006  REF 222  LAST  887      31,3215  0 6006 1  LNDMKSEL TC     INTPRET
0007                          31,3216   77834 0          RTB
0008  REF  25  LAST  887      31,3217   45505 0                   LOADTIME      PICK UP TIME SCALED B-28
0009  REF  37  LAST  697      31,3220   01046 1          STORE  DSPTEM1
0010                          31,3221   77776 1          EXIT
0011  REF   1                 31,3222  3 3535 1  DISGET   CAP    V06N34**      DISPLAY GROUND ELAPSED TIME
0012  REF 241  LAST  888      31,3223  0 4555 0          TC     BANKCALL
0013  REF   6  LAST  582      31,3224   20485 1          CADR   GOMARKP
0014  REF  33  LAST  888      31,3225  0 5423 1          TC     ENDEXT        TERMINATE WITH V34E
0015  REF   1                 31,3226  0 3230 0          TC     CALCTLS       PROCEED WITH V33E
0016  REF   1                 31,3227  0 3222 0          TC     DISGET        NEW TIME LOADED VIA V25E
0017  REF 223  LAST  889      31,3230  0 6008 1  CALCTLS  TC     INTPRET
0018                          31,3231   43175 0          VLOAD  SET
00181 REF   6  LAST  697      31,3232   02028 1                 RLS
001815 REF 12  LAST  857      31,3233   00462 1                 ERADFLAG      SET. CONSTANT REARTH (RM)
00182                         31,3234   14001 0          STODL  0D            PD0-5 & RP VECTOR
00183 REF   1                 31,3235   23534 1                 RRCSML
00184                         31,3236   14007 0          STODL  6D            PD6-7 & DUMMY TIME
00185 REF   2  LAST  889      31,3237   23534 1                 RRCSML        MPAC & NON-ZERO FOR MOON CASE
001853                        31,3240   77614 1          SET
001858 REF 21  LAST  857      31,3241   01483 1                 LUNAFLAG      SET. LUNAR LAT-LONG
00186                         31,3242   77624 1          CALL
00187 REF   1                 31,3243   61782 0                 RPTOLONG      RP TO LONG
00188                         31,3244   77745 1          DLOAD
00189 REF   8  LAST  857      31,3245   01108 1                 LONG
001895 REF  1                 31,3246   16353 0          STODL  LSLONG        SAVE LND SITE LONG.
0019  REF  38  LAST  889      31,3247   01046 1                 DSPTEM1
0020  REF  47  LAST  887      31,3250   34041 0          STCALL TDEC1         ADVANCE INTEGRATION TO TIME IN TDEC1
0021  REF   7  LAST  658      31,3251   27022 1                 CSMPREC       USING PRECISION INTEGRATION
0022                          31,3252   77775 1          VLOAD
0023  REF   6  LAST  598      31,3253   00017 1                 RATT1
0025  REF   2  LAST   88      31,3254   02337 1          STORE  POSVECT       SAVE POSITION VECTOR SCALED B-27
0026  REF  15  LAST  857      31,3255   26152 0          STOVL  ALPHAV        FOR LAT-LONG
0026  REF   5  LAST  503      31,3256   00025 0                 VATT1
0030  REF   2  LAST   86      31,3257   16345 1          STODL  VELVECT       SAVE VEL. VECTOR B-5
0031  REF  10  LAST  887      31,3260   00015 0                 TAT
0032  REF   2  LAST   68      31,3261   36323 0          STCALL VECTIME       SAVE TIME
0033  REF   7  LAST  857      31,3262   26322 0                 LAT-LONG      COMPUTE LAT, LONG, ALT OF S/C  PD600
0034                          31,3263   76145 0          DLOAD  AXT,1         SAVE S/C LONGITUDE
0035  REF   9  LAST  889      31,3264   01106 1                 LONG
0036  REF   2  LAST  889      31,3265   02352 1                 LSLONG        XR1 = LANDING SITE LONG--SINUS MEDII,OCE
0037  REF   2  LAST   66      31,3266   36335 1          STCALL LONGSAVE      ANUS PROCELLARUM, MARE TRANQUILLITEATIS
0038  REF   1                 31,3267   63414 0                 ELAPTIME      COMPUTE TL (TIME TO LANDING SITE)
```

```
0039  REF  39  LAST  889   31,3270  01046 1            STORE  DSPTEM1      SAVE TL FOR OUTPUT TO DSKY
0040                       31,3271  77778 1            EXIT
0041  REF   1              31,3272  3 3538 1  DISTLS   CAF    V06N31**     DISPLAY TIME TO LANDING SITE
0042  REF 242  LAST  889   31,3273  0 4555 0           TC     BANKCALL
0043  REF   7  LAST  889   31,3274   20485 1           CADR   GOMARKP
0044  REF  34  LAST  889   31,3275  0 5423 1           TC     ENDEXT       TERMINATE WITH V34E
0045  REF   1              31,3276  0 3300 1           TC     PROCLMKS     PROCEED WITH V33E
0046  REF   1              31,3277  0 3272 0           TC     DISTLS       ILLEGAL RESPONSE, DO AGAIN
0047  REF 224  LAST  889   31,3300  0 8008 1  PROCLMKS TC     INTPRET      BEGIN LANDMARK PROCESSING
0048                       31,3301   75170 0           AXT,1  AXC,2       SET COUNTERS FOR LOOP CONTROL
0049  REF   1              31,3302   00005 1                  KCOUNT
0050  REF   1              31,3303   00002 0                  JCOUNT
0051                       31,3304   43134 0           SXA,2  SET
0052  REF   3  LAST  889   31,3305   02324 0                  JLOOPCNT
0053  REF  13  LAST  889   31,3308   00482 1                  ERADFLAG     USE MEAN LUNAR RADIUS
0054                       31,3307   68730 0  KLOOP    SXA,1  SLOAD*
0055  REF   3  LAST  257   31,3310   02325 1                  KLOOPCNT
0056  REF   1              31,3311   23534 1                  BANDTABL +5,1
0057  REF   2  LAST   88   31,3312   16327 0           STODL  NKVAL        SAVE LONGITUDE BAND
0058  REF  11  LAST  888   31,3313   15340 1                  DPPOSMAX
0059  REF   2  LAST   88   31,3314   02330 0           STORE  DELTAL
0060                       31,3315   54170 0  JLOOPP   AXT,1  XSU,1        SET XR1 FOR LONGITUDE OF LANDMARK
0061  REF   3  LAST  822   31,3316   63620 0                  LONGTAB -2
0062  REF   4  LAST  890   31,3317   02324 0                  JLOOPCNT
0063                       31,3320   77624 1           CALL
0064  REF   2  LAST  889   31,3321   63414 0                  ELAPTIME     COMPUTE TL (TIME TO LANDMARK)
0065  REF   3  LAST  126   31,3322   02321 0           STORE  XR1HOLD
0066                       31,3323   45014 0           SET    CALL          COMPUTE LATITUDE AND LONGITUDE OF S/C
0067  REF  22  LAST  669   31,3324   01463 1                  LUNAFLAG     AT LANDMARK
0068  REF   6  LAST  869   31,3325   26322 0                  LAT-LONG
0069                       31,3326   77754 1           LXA,2                                        PD=00
0070  REF   5  LAST  690   31,3327   02324 0                  JLOOPCNT
0071                       31,3330   44343 0           DLOAD* BDSU
0072  REF   3  LAST  822   31,3331   54240 0                  LATTAB -2,2
0073  REF  13  LAST  857   31,3332   01104 0                  LAT
0074                       31,3333   41448 1           ABS    PUSH          DELTA LAT = ABS(LAT - LATJ)    PD=02
0075                       31,3334   51025 1           DSU    BPL           DELTAL GREATER THAN DELTA LAT
0076  REF   3  LAST  690   31,3335   02330 0                  DELTAL
0077  REF   1              31,3336   63345 0                  LMKLOOP      NO
0078                       31,3337   45545 1           DLOAD  STADR                                    PD=00
0079  REF   4  LAST  890   31,3340   81447 1           STODL  DELTAL       DELTA LAT = DELTAL
0080  REF   4  LAST  890   31,3341   02321 0                  XR1HOLD
0081  REF  40  LAST  890   31,3342   01048 1           STORE  DSPTEM1      SAVE TIME TO LANDMARK
0082                       31,3343   77734 1           SXA,2
0083  REF   2  LAST   86   31,3344   02333 0                  INDEXNUM     SAVE LANDMARK I.D.
0084                       31,3345   67114 1  LMKLOOP  INCR,2 SXA,2        J = J + 2
0085                       31,3348   77775 1           OCT    -2
0088  REF   8  LAST  890   31,3347   02324 0                  JLOOPCNT
0087                       31,3350   45335 0           SLOAD  DSU
0088  REF  25  LAST  867   31,3351   00050 1                  X2
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0089  REF   3  LAST  890   31,3352   02327 0                    NKVAL
0090                       31,3353   52030 0          BHIZ      GOTO      J = NKVAL
0091  REF   1              31,3354   63356 1                    DISLID    YES, GO DISPLAY LANDMARK ID, MAYBE TL
0092  REF   1              31,3355   63315 0                    JLOOPP    NO, ONE MORE TIME
0093                       31,3356   70535 0  DISLID  SLOAD     SR1       ID = -INDEXNUM/2 + 1
0094  REF   3  LAST  890   31,3357   02334 1                    INDEXNUM
0095                       31,3360   63144 0          LXC,2     INCR,2
0098  REF 288  LAST  883   31,3381   00154 1                    MPAC +0
0097                       31,3362   00001 0                    1D
0098                       31,3363   77534 0          SXA,2     EXIT
0099  REF  24  LAST  732   31,3384   02751 0                    LANDMARK
0100  REF   1              31,3385   3 3537 0         CAF       V05N70**  DISPLAY LANDMARK ID
0101  REF 243  LAST  890   31,3368   0 4555 0         TC        BANKCALL
0102  REF   4  LAST  888   31,3367    20504 1         CADR      GOMARKFR
0103  REF  35  LAST  890   31,3370   0 5423 1         TC        ENDEXT    TERMINATE WITH V34E
0104  REF   1              31,3371   0 3376 0         TC        DISTTL    PROCEED WITH V33E
0105  REF   1              31,3372   0 3404 1         TC        NEXTBAND  RECYCLE WITH V32E
0106  REF  21  LAST  840   31,3373   3 4715 0         CAF       FIVE      BLANK R1 AND R3
0107  REF  17  LAST  888   31,3374   0 5415 1         TC        BLANKET
0108  REF 103  LAST  888   31,3375   0 5112 0         TC        ENDOPJOB
0109  REF   2  LAST  889   31,3378   3 3535 1  DISTTL CAF       V08N34**  DISPLAY GROUND ELAPSED TIME TO LANDMARK
0110  REF 244  LAST  891   31,3377   0 4555 0         TC        BANKCALL
0111  REF   8  LAST  890   31,3400    20465 1         CADR      GOMARKF
0112  REF  36  LAST  891   31,3401   0 5423 1         TC        ENDEXT    TERMINATE WITH V34E
0113  REF   2  LAST  891   31,3402   0 3404 1         TC        NEXTBAND  PROCEED WITH V33E
0114  REF   2  LAST  891   31,3403   0 3376 0         TC        DISTTL    ILLEGAL RESPONSE, DO AGAIN
0115  REF 225  LAST  890   31,3404   0 6008 1  NEXTBAND TC       INTPRET   MUST WE GO ON
0116                       31,3405   66350 1          LXA,1     SSP       RESTORE COUNTER
0117  REF   4  LAST  890   31,3408   02325 1                    KLOOPCNT
0118  REF  36  LAST  872   31,3407   00051 0                    S1
0119                       31,3410   00001 0                    1D
0120                       31,3411   77500 1          TIX,1     EXIT
0121  REF   1              31,3412   63307 0                    KLOOP     YES, K = K - 1
0122  REF  37  LAST  891   31,3413   0 5423 1         TC        ENDEXT    K = 0, EXIT R35
```

```
0123
0124  REP   1
0125  REP   5  LAST  890
0126
0127
0128
0129  REP   4  LAST  666
0130  REP   3  LAST  669
0131
0132  REP  12  LAST  690
0133  REP   5  LAST  732
0134
0135  REP   3  LAST  669
0136
0137  REP   1
0136
0139
0140  REP   2  LAST  692
0141
0142
0143  REP   4  LAST  692
0144  REP   3  LAST  669
0145
0146
0147  REP   3  LAST  669
0148  REP   6  LAST  692
0149
0150
0151  REP   3  LAST  669
0152
0153
0154  REP   1
0155
0156
0157  REP   1
0156
0159
0160  REP  16  LAST  669
0161
0162  REP   1
0163  REP   8  LAST  850
0164
0165  REP   6  LAST  850
01651 REP   2  LAST  892
01652
01653 REP  17  LAST  692
01654
01655
01656
01657 REP   9  LAST  892

31,3414  66020 0  ELAPTIME STQ    SXA,1
31,3415  02321 0                  RETLOCN
31,3416  02320 1                  XR1HOLD
31,3417  77601 0           SETPD
31,3420  00001 0                  0D
31,3421  65375 0           VLOAD  PDDL
31,3422  15324 0                  HIUNITZ
31,3423  02323 1                  VECTIME
31,3424  45125 0           PDDL   CALL
31,3425  15340 1                  DPPOSMAX
31,3426  55341 1                  RP-TO-R
31,3427  53515 0           PDVL   UNIT
31,3430  02337 1                  POSVECT
31,3431  47206 0           PUSH   VXV
31,3432  00001 0                  UZZ
31,3433  53572 1           VSL1   UNIT
31,3434  47206 0           PUSH   VXV
31,3435  00001 0                  UZZ
31,3436  53572 1           VSL1   UNIT
31,3437  47315 0           PDVL   VXV
31,3440  02337 1                  POSVECT
31,3441  02345 1                  VELVECT
31,3442  53572 1           VSL1   UNIT
31,3443  70125 0           PDDL   LXC,1
31,3444  02335 0                  LONGSAVE
31,3445  02320 1                  XR1HOLD
31,3446  41223 1           DSU*   DMP
31,3447  00001 0                  0,1
31,3450  23534 1                  RRCSML
31,3451  73406 1           PUSH   SIN
31,3452  76561 1           VXSC   VSL1
31,3453  00023 0                  UNN
31,3454  71525 0           PDDL   COS
31,3455  76561 1           VXSC   VSL1
31,3456  00015 0                  UW
31,3457  47255 0           VAD    VXV
31,3460  53572 1           VSL1   UNIT
31,3461  02152 0           STORE  ALPHAV
31,3462  72441 0           DOT    SL1
31,3463  00007 0                  URR
31,3464  02734 0           STORE  CSTH
31,3465  73526 1           ACOS   SIN
31,3466  26732 0           STOVL  SNTH
31,3467  00007 0                  URR
31,3470  50235 0           VXV    DOT
31,3471  02152 0                  ALPHAV
31,3472  00031 0                  24D
31,3473  71244 0           BPL    DLOAD
31,3474  63500 1                  +4D
31,3475  02732 0                  SNTH
```

SAVE RETURN AND INDEX 1

SET UP FOR RP-TO-R

TRANSFORM PLANETARY TO RCS — PD=00
COMPUTE AND STORE UZ — PD=06
POSITION VECTOR OF CM SCALED B-27
COMPUTE AND STORE UR = UNIT(R) — PD=12

COMPUTE AND STORE UW=UNIT(UR X UZ) PD=18

COMPUTE AND STORE UN=UNIT(UW X UZ) PD=24
POSITION VECTOR OF CM SCALED B-27
VELOCITY VECTOR OF CM SCALED B-5
COMPUTE AND STORE U = UNIT(R X V) PD=30
RESTORE INDEX 1 COMPLEMENTED

DLONG = .997(LONG - LONGJ) — PD=32

U'W = UW COS(DLONG) + UN SIN(DLONG) — PD=36

UD = UNIT (U'W X U) — PD=30,PD=24
SET UD FOR LAT-LONG--POINT OF CLOSEST APPROACH
COS (THETA) = (UD . UR)

THETA = ACOS(UD.UR), 0 TO PI
SIN (THETA), 0 TO PI

CHK (UR X UD).U

NEG, THETA = 2 PI - THETA

```
01658                          31,3476  77676 0          DCOMP                ERGO SIN (THETA) = - SIN (THETA)
01659  REP  10  LAST  892      31,3477  02732 0          STORE   SNTH
0166                           31,3500  43175 0          VLOAD   SET
0167   REP   5  LAST  892      31,3501  02337 1                  POSVECT
0168   REP   7  LAST  883      31,3502  03466 0                  RVSW         TIME ONLY
0169   REP  10  LAST  863      31,3503  26657 1          STOVL   RVEC
0170   REP   4  LAST  892      31,3504  02345 1                  VELVECT
0171   REP  14  LAST  863      31,3505  02746 0          STORE   VVEC
0172                           31,3506  45180 1          AXC,1   CALL
0173                           31,3507  00012 1                  10D          MOON ONLY
0174   REP   6  LAST  850      31,3510  24737 1                  TIMETHET     COMPUTE TRANSFER TIME
0175                           31,3511  43014 0          BON     BON
0176   REP   1                 31,3512  04313 1                  COGAFLAG     NO SOLUTION SINCE NEAR RECTILINEAR
0177   REP   1                 31,3513  63523 0                  ETERROR
0178   REP   1                 31,3514  04310 1                  INFINFLG     NO PHYSICAL SOLUTION EXISTS
0179   REP   2  LAST  893      31,3515  63523 0                  ETERROR
0180                           31,3516  43345 1          DLOAD   DAD          COMPUTE GROUND ELAPSED TIME        PD=00
0181   REP   4  LAST  892      31,3517  02323 1                  VECTIME
0182   REP   9  LAST  863      31,3520  00037 0                  T
0183                           31,3521  77850 1          GOTO
0184   REP   2  LAST  892      31,3522  02321 0                  RETLOCN      EXIT ELAPTIME
0185                           31,3523  52145 0 ETERROR  DLOAD   GOTO         RETURN WITH ZERO
0186   REP  25  LAST  887      31,3524  15332 1                  HI6ZEROS
0187   REP   3  LAST  893      31,3525  02321 0                  RETLOCN
```

```
L       LUNAR LANDMARK SELECTION FOR CM

R016703 SUBROUTINE TO CONVERT RP (VECTOR IN PLAN. COORD. SYSTEM, EITHER
R018706  EARTH-FIXED OR MOON-FIXED) TO LAT, LONG, ALT.
R018709 CALLING SEQUENCE
R018712  L       CALL
R018715  L+1             RPTOLONG
R018718 SUBROUTINES USED
R018721  RP-TO-R, LAT-LONG
R018724 INPUT
R018727  PD0-5D = RP VECTOR
R01873   PD6-7D = TIME
R018733  MPAC = 0 FOR EARTH, NON-ZERO FOR MOON.
R018736  ERADFLAG, LUNAFLAG.
R018739 OUTPUT
R018742  LATITUDE  IN LAT     (REVS. B-0)
R018745  LONGITUDE IN LONG    (REVS. B-0)
R018748  ALTITUDE  IN ALT     (METERS B-29)
 018749 REF   1                30,2000                    SETLOC R35A
 01875                         30,3762                    BANK

 018751
 018754 REF   4  LAST  893     30,3762  45020 1  RPTOLONG STQ     CALL      SAVE RETURN
 018757 REF   6  LAST  892     30,3763  02321 0           BOFF    RETLOCN
 01876                         30,3764  55341 1                   RP-TO-R   CONVERT RP TO R, B-27 FOR MOON
 018763 REF  23  LAST  890     30,3765  70414 1           BOFF    VSR2      IF LUNAR RESCALE B-27 TO B-29
 018766                        30,3766  01743 0                   LUNAFLAG
 018769 REF  18  LAST  892     30,3767  61770 0                   +1
 018772 REF   4  LAST  892     30,3770  16152 0           STODL   ALPHAV
 018775                        30,3771  23534 1                   RRCSML    MPAC & DUMMY TIME
 018778 REF   9  LAST  890     30,3772  77624 1           CALL
 01879                         30,3773  26322 0                   LAT-LONG
 018793 REF   5  LAST  894     30,3774  77650 1           GOTO
 018795 REF   2  LAST  889     30,3775  02321 0                   RETLOCN
 018796                        31,2000                    SETLOC R35
                               31,3526                    BANK

 0188                          31,3526  77763 0  BANDTABL DEC     -12       +60 DEGREE BAND
 0189                          31,3527  77751 1           DEC     -22       +30 DEGREE BAND
 0190                          31,3530  77737 1           DEC     -32       +00 DEGREE BAND
 0191                          31,3531  77725 1           DEC     -42       -30 DEGREE BAND
 0192                          31,3532  77713 1           DEC     -52       -60 DEGREE BAND
 0193                          31,3533  37716 0  RRCSML   2DEC    .997
 0193                          31,3534  33106 0
 0194                          31,3535  01442 1  V06N34** VN      00634     ****************************************
 0195                          31,3536  01437 0  V06N31** VN      00631
 0196                          31,3537  01306 0  V05N70** VN      00570
 0197                            0005           KCOUNT   EQUALS  5D
 0198                            0002           JCOUNT   EQUALS  2D
 0199                            0022           UNN      EQUALS  18D
 0200                            0014           UW       EQUALS  12D
 0201                            0006           URR      EQUALS  6D
 0202                            0000           UZZ      EQUALS  0D
```

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R0203          **** TEMPORARY VALUES FOR LANDMARK TABLES-LEVINE/SAPONARO****

R02031               LATTAB HAS LATITUDES THAT GO FROM +8 TO -8 DEGREES
R02032               LONGTAB HAS LONGITUDES THAT GO FROM +60 TO -60 DEGREES
R02033               LATTAB AND LONGTAB ARE SCALED REVOLUTIONS B0
R02034               ALTTAB HAS ALTITUDES MEASURED ABOVE THE MEAN LUNAR RADIUS
R02035               ALTTAB IS SCALED IN METERS B-29

                                                          COUNT  31/LNDMK
02036  REF  1
0204            31,3540  77406 0  LATTAB   2DEC  -.015231481     2   5  29 S
0204            31,3541  56241 0
0205            31,3542  00043 0           2DEC  .002175926      3   0  47 N
0205            31,3543  24640 0
0206            31,3544  00046 0           2DEC  .002361111      4   0  51 N
0206            31,3545  25716 0
0207            31,3546  77741 0           2DEC  -.001851852     5   0  40 S
0207            31,3547  65080 1
0208            31,3550  00055 1           2DEC  .002777776      6   1  00 N
0208            31,3551  20268 1
0209            31,3552  77720 1           2DEC  -.002916667     7   1  03 S
0209            31,3553  48648 1
0210            31,3554  77846 0           2DEC  -.005462963     10  1  58 S
0210            31,3555  57852 1
0211            31,3556  00155 0           2DEC  .006666667      11  2  24 N
0211            31,3557  07202 0
0212            31,3560  00466 0           2DEC  .018935185      12  6  49 N
0212            31,3561  07373 1
0213            31,3562  00050 1           2DEC  .00250          13  0  54 N
0213            31,3563  38561 0
0214            31,3564  00070 0           2DEC  .003425926      14  1  14 N
0214            31,3565  04130 1
0215            31,3566  77862 0           2DEC  -.004722222     15  1  42 S
0215            31,3567  64143 0
0216            31,3570  77747 0           2DEC  -.001481481     16  0  32 S
0216            31,3571  67215 0
0217            31,3572  00082 0           2DEC  .003101852      17  1  07 N
0217            31,3573  32207 0
0218            31,3574  00070 0           2DEC  .003472222      20  1  15 N
0218            31,3575  34343 1
0219            31,3576  77483 0           2DEC  -.0125          21  4  30 S
0219            31,3577  46314 0
0220            31,3600  00004 0           2DEC  .000277777      22  0  06 N
0220            31,3601  21505 1
0221            31,3602  00271 0           2DEC  .011342592      23  4  05 N
0221            31,3603  32822 0
0222            31,3604  00101 1           2DEC  .003981481      24  1  28 N
0222            31,3605  07343 1
0223            31,3606  77574 1           2DEC  -.008009259     25  2  53 S
0223            31,3607  70656 0
0224            31,3610  00065 1           2DEC  .003240741      26  1  10 N
0224            31,3611  03052 0
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0225		31,3612	77642 1		2DEC	-.005694444	27	2 03 S	
0225		31,3613	66360 1						
0226		31,3614	00045 0		2DEC	.002266516	30	0 49 N	
0226		31,3615	05267 1						
0227		31,3616	77577 1		2DEC	-.007624074	31	2 49 S	
0227		31,3617	71734 1						
0228		31,3620	00130 0		2DEC	.005416667	32	1 57 N	
0228		31,3621	27711 0						
0229		31,3622	05120 1	LONGTAB	2DEC	.161157407	2	58 01 E	
0229		31,3623	14712 0						
0230		31,3624	05076 0		2DEC	.160046296	3	57 37 E	
0230		31,3625	06264 1						
0231		31,3626	04453 1		2DEC	.143287037	4	51 35 E	
0231		31,3627	23531 1						
0232		31,3630	03554 0		2DEC	.116018518	5	41 46 E	
0232		31,3631	33074 1						
0233		31,3632	03326 0		2DEC	.106651852	6	38 26 E	
0233		31,3633	25112 1						
0234		31,3634	03263 0		2DEC	.104675926	7	37 41 E	
0234		31,3635	00252 1						
0235		31,3636	03014 1		2DEC	.094537037	10	34 02 E	
0235		31,3637	34505 0						
0236		31,3640	03007 0		2DEC	.094212963	11	33 55 E	
0236		31,3641	22564 0						
0237		31,3642	02740 0		2DEC	.091605555	12	33 03 E	
0237		31,3643	04432 0						
0238		31,3644	02531 1		2DEC	.083564815	13	30 05 E	
0238		31,3645	04017 0						
0239		31,3646	02066 0		2DEC	.065633333	14	23 42 E	
0239		31,3647	23501 1						
0240		31,3650	01502 1		2DEC	.050925926	15	16 20 E	
0240		31,3651	13664 1						
0241		31,3652	01272 1		2DEC	.042636669	16	15 21 E	
0241		31,3653	23036 0						
0242		31,3654	00570 0		2DEC	.023009259	17	8 17 E	
0242		31,3655	37365 0						
0243		31,3656	00252 1		2DEC	.010416667	20	3 45 E	
0243		31,3657	25253 1						
0244		31,3660	00000 1		2DEC	.000046296	21	0 01 E	
0244		31,3661	30213 1						
0245		31,3662	77703 0		2DEC	-.003703704	22	1 20 W	
0245		31,3663	52142 1						
0246		31,3664	77254 1		2DEC	-.020694444	23	7 27 W	
0246		31,3665	76114 1						
0247		31,3666	77173 1		2DEC	-.023703704	24	8 32 W	
0247		31,3667	64334 1						
0248		31,3670	76265 1		2DEC	-.051435185	25	18 31 W	
0248		31,3671	51114 1						
0249		31,3672	75644 0		2DEC	-.066055556	26	24 30 W	
0249		31,3673	77223 1						

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0250                31,3674  75215 0          2DEC  -.085092593   27  30  38 W
0250                31,3675  72762 1
0251                31,3676  74613 0          2DEC  -.100833333   30  36  18 W
0251                31,3677  76225 0
0252                31,3700  74571 1          2DEC  -.101944444   31  36  42 W
0252                31,3701  67600 0
0253                31,3702  74174 0          2DEC  -.117407407   32  42  16 W
0253                31,3703  54550 0
0254                31,3704  77777 0 ALTTAB   2DEC  -2090 B-29      2
0254                31,3705  75752 0
0255                31,3706  77777 0          2DEC  -2090 B-29      3
0255                31,3707  75752 0
0256                31,3710  77777 0          2DEC  -1790 B-29      4
0256                31,3711  76200 1
0257                31,3712  77777 0          2DEC  -1090 B-29      5
0257                31,3713  76736 1
0258                31,3714  77777 0          2DEC  -940 B-29       6
0258                31,3715  77051 0
0259                31,3716  77777 0          2DEC  -290 B-29       7
0259                31,3717  77556 1
0260                31,3720  77777 0          2DEC  -290 B-29       10
0260                31,3721  77556 1
0261                31,3722  77777 0          2DEC  -1549 B-29      11
0261                31,3723  76370 1
0262                31,3724  77777 0          2DEC  -890 B-29       12
0262                31,3725  77102 1
0263                31,3726  77777 0          2DEC  -1490 B-29      13
0263                31,3727  76426 0
0264                31,3730  77777 0          2DEC  -3230 B-29      14
0264                31,3731  74660 1
0265                31,3732  00000 1          2DEC  5110 B-29       15
0265                31,3733  04773 0
0266                31,3734  00000 1          2DEC  6910 B-29       16
0266                31,3735  06577 1
0267                31,3736  00000 1          2DEC  5110 B-29       17
0267                31,3737  04773 0
0268                31,3740  00000 1          2DEC  3010 B-29       20
0268                31,3741  02741 1
0269                31,3742  00000 1          2DEC  3910 B-29       21
0269                31,3743  03643 0
0270                31,3744  77777 0          2DEC  -935 B-29       22
0270                31,3745  77053 1
0271                31,3746  00000 1          2DEC  2360 B-29       23
0271                31,3747  02234 0
0272                31,3750  00000 1          2DEC  2510 B-29       24
0272                31,3751  02347 0
0273                31,3752  00000 1          2DEC  210 B-29        25
0273                31,3753  00151 1
0274                31,3754  00000 1          2DEC  960 B-29        26
0274                31,3755  00740 1
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0275                    31,3756  00000 1
0275                    31,3757  01217 1        2DEC  1310 B-29     27
0276                    31,3760  00000 1
0276                    31,3761  01301 1        2DEC  1410 B-29     30
0277                    31,3762  77777 0
0277                    31,3763  75337 1        2DEC  -2624 B-29    31
0278                    31,3764  77777 0
0278                    31,3785  75470 0        2DEC  -2445 B-29    32
*** END OF PANDORA .080 ***
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R1000   NAME     TVCDAPON (TVC DAP INITIALIZATION AND STARTUP CALL)
R1001   MOD NO 3                        DATE  8 JUNE,1987
R1002   MOD BY ENGEL                    LOG SECTION P40-P47

R1003   FUNCTIONAL DESCRIPTION
R1004        PERFORMS TVCDAP INITIALIZATION (GAINS, TIMING PARAMETERS, FILTER VARIABLES, ETC.)
R1006        COMPUTES STEERING (S40.8) GAIN KPRIMEDT, AND ZEROES PASTDELV,+1 VARIABLE
R1008        MAKES INITIALIZATION CALL TO ..NEEDLER.. FOR TVC DAP NEEDLES-SETUP
R1009        PERFORMS INITIALIZATION FOR ROLL DAP
R1010        CALLS TVCEXECUTIVE AT TVCEXEC, VIA WAITLIST
R1011        CALLS TVCDAP CDU-RATE INITIALIZATION PKG AT DAPINIT  VIA T5
R1012        MRCLEAN AND TVCINIT4 ARE POSSIBLE TVC-RESTART ENTRIES
R1013   CALLING SEQUENCE - T5LOC=2CADR(TVCDAPON,EBANK=BZERO), T5=.6SECT5
R1014        IN PARTICULAR, CALLED BY ..IGNOVER..
R1015   NORMAL EXIT MODE
R1016        TCP RESUME
R1017   SUBROUTINES CALLED
R1018        NEEDLER, MASSPROP
R1019   ALARM OR ABORT EXIT MODES
R1020        NONE
R1021   ERASABLE INITIALIZATION REQUIRED
R1022        CSMMASS, LEMMASS, DAPDATR1 (FOR MASSPROP SUBROUTINE)
R1023        TVC PAD LOADS (SEE LEVEL III DAP AND/OR P40 TESTS)
R1024        PACTOFF, YACTOFF, CDUX
R1025        TVCPHASE, T5BITS OF FLAGWRD6, FOR RESTART PROTECTION (SEE IGNOVER)
R1026   OUTPUT
R1027        ALL TVC AND ROLL DAP ERASABLES, FLAGWRD6 (BITS 13,14), T5, WAITLIST
R1028   DEBRIS
R1029        NONE

 1030   REF   1                                          COUNT* $$/INIT
 1031                                                    BANK   17
 1032   REF   3  LAST  683   17,2000                     SETLOC DAPS7
 1033                        17,2030                     BANK

 1034   REF   2  LAST  184   E6,1742                     EBANK= BZERO

 1035   REF   7  LAST  891   17,2030  22 018 0  TVCDAPON LXCH   BANKRUPT      T5 RUPT ARRIVAL (CALL BY DOTVCON - P40)
 1036                        17,2031  0 0008 1           EXTEND                SAVE Q REQUIRED IN RESTARTS (MRCLEAN AND
10361   REF   7  LAST  692   17,2032  22 012 1           QXCH   QRUPT                TVCINIT4 ARE ENTRIES)
 1038   REF   1               17,2033  3 2205 1  MRCLEAN  CAF   NZERO        NUMBER TO ZERO, LESS ONE  (MUST BE ODD)
A1039                                                                            TVC RESTARTS ENTER HERE  (NEW BANK)
 1040   REF 187  LAST  841   17,2034  10 000 0     +1    CCS    A
 1041   REF  14  LAST  687   17,2035  55=447 0           TS     CNTR
 1042   REF 156  LAST  850   17,2036  3 4714 1           CAF    ZERO
 1043   REF  78  LAST  842   17,2037  54 001 1           TS     L
 1044   REF  15  LAST  899   17,2040  51=447 1           INDEX  CNTR
 1045   REF   1               17,2041  53=530 1           DXCH   OMEGAYC       FIRST (LAST) TWO LOCATIONS
 1046   REF  16  LAST  899   17,2042  11=447 0           CCS    CNTR
 1047   REF   1               17,2043  1 2034 0           TCF    MRCLEAN +1
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10471                                17,2044  0 0006 1                EXTEND
10472  REF   1                      17,2045  3 2212 1                DCA     IN1TLOC2
10473  REF  12  LAST  692           17,2046  53=313 0                DXCH    T5LOC
10474  REF  17  LAST  777           17,2047  3 4672 0                CAF     POSMAX
10475  REF   8  LAST  692           17,2050  54 030 0                TS      TIME5
10476  REF  26  LAST  692           17,2051  1 5222 1   ENDMRC       TCF     RESUME

10477  REF   8  LAST  699           17,2052  22 016 0   TVCINIT1     LXCH    BANKRUPT
10478                                17,2053  0 0006 1                EXTEND
10479  REF   8  LAST  899           17,2054  22 012 1                QXCH    QRUPT

1046   REF  31  LAST  690           17,2055  0 4633 0                TC      IBNKCALL
1049   REF   4  LAST  654           17,2056   13207 0                CADR    MASSPROP

1050   REF   4  LAST  849           17,2057  30 110 1                CAE     EMDOT
1051                                17,2060  0 0006 1                EXTEND
1052   REF   1                      17,2061  7 2206 0                MP      ONETHOU
1053   REF   2  LAST  103           17,2062  55=647 1                TS      TENMDOT
1054                                17,2063  4 0000 0                COM
1055   REF  11  LAST  664           17,2064  6 1474 1                AD      CSMMASS
1056   REF   7  LAST  664           17,2065  55=662 0                TS      MASSTMP

1059   REF  60  LAST  692           17,2066  31=466 1                CAE     DAPDATR1
1060   REF  44  LAST  747           17,2067  7 4675 0                MASK    BIT14
1061   REF 188  LAST  699           17,2070  10 000 0                CCS     A
1062   REF  61  LAST  686           17,2071  3 4712 1                CAF     BIT1
1063   REF  17  LAST  899           17,2072  55=447 0                TS      CNTR

10631  REF  16  LAST  900           17,2073  51=447 1                INDEX   CNTR
106312 REF   1                      17,2074  31=416 0                CAE     EKTLX/1
106314 REF   2  LAST  103           17,2075  55=646 0                TS      KTLX/I

10632  REF  32  LAST  900           17,2076  0 4633 0                TC      IBNKCALL
106322 REF   1                      17,2077   35145 1                CADR    S40.15

1064   REF   1                      17,2100  31=420 0   TVC1N1T2     CAE     ETVCDT/2
1065   REF  79  LAST  899           17,2101  54 001 1                TS      L
1066   REF  34  LAST  778           17,2102  3 4711 1                CAF     BIT2
1067   REF  19  LAST  900           17,2103  51=447 1                INDEX   CNTR
1068   REF 169  LAST  900           17,2104  30 000 1                CAE     A
1069   REF   3  LAST  677           17,2105  55=644 1                TS      KPRIMEDT

1070                                17,2106  4 0000 0                COM
1071   REF  16  LAST  900           17,2107  6 4672 0                AD      POSMAX
1072   REF  62  LAST  900           17,2110  6 4712 1                AD      BIT1
1073   REF   3  LAST  245           17,2111  55=635 1                TS      T5TVCDT

10732  REF  36  LAST  700           17,2112  4 4674 1                CS      BIT15
10733  REF  10  LAST  654           17,2113  7 0105 1                MASK    FLAGWRD9
10734  REF  11  LAST  900           17,2114  54 105 1                TS      FLAGWRD9
```

SET UP ANOTHER T5 RUPT TO CONTINUE INITIALIZATION AT TVC1N1T1
THE PHSCHK2 ENTRY (REDOTVC) AT TVCDAPON +3 IS IN ANOTHER BANK. MUST RESET BBCON TOO (FULL 2CADR), FOR THAT ENTRY.

UPDATE IXX, IAVG/TLX FOR DAP GAINS (R03 OR NOUNS 46 AND 47 MUST BE CORRECT)

SPS FLOW RATE, SC.AT B+3 KG/CS

10-SEC MASS LOSS B+16 KG

DECREMENT FOR FIRST 10 SEC OF BURN

CHECK LEM-ON/OFF

LEM-ON (BIT1)
LEM-OFF (ZERO)

PICK UP LM-OFF,-ON KTLX/I

COMPUTE 1/CONACC, VARK

LEM-ON VALUE (PAD-LOAD, CS / 2)

LEM-OFF VALUE (4CS / 2)

(TEMP STORE)

PREPARE T5TVCDT

RESET SWTOVER FLAG

```
1074  REF  20  LAST  900   17,2115  51=447 1          INDEX  CNTR      PICK UP LEM-OFF,-ON KPRIME
1075  REF   1                17,2116  31=413 0          CAE    EKPRIME
1076                         17,2117  0 0006 1          EXTEND
1077  REF   4  LAST  900   17,2120  7 1644 1          MP     KPRIMEDT  (TVCDT/2, SC.AT B+14CS)
1078  REF 190  LAST  900   17,2121  22 000 1          LXCH   A            SC.AT PI/8     (DIMENSIONLESS)
1079  REF   5  LAST  901   17,2122  53=345 0          DXCH   KPRIMEDT

1080  REF  21  LAST  901   17,2123  51=447 1          INDEX  CNTR      PICK UP LEM-OFF,-ON REPFRAC
1081  REF   2  LAST  676   17,2124  31=423 0          CAE    EREPFRAC
1082  REF   4  LAST  678   17,2125  55=652 0          TS     REPFRAC

1083  REF  14  LAST  575   17,2126  3 7716 0          CAF    NEGONE    PREVENT STROKE TEST UNTIL CALLED
1084  REF   2  LAST  103   17,2127  55=664 0          TS     STRKTIME

1085  REF   1                17,2130  3 4374 0          CAF    NINETEEN  SET VCNTR FOR VARIABLE-GAIN UPDATES IN
1086  REF   4  LAST  678   17,2131  55=653 1          TS     VCNTR           10 SECONDS (TVCEXEC 1/2 SEC RATE)
10862 REF   7  LAST  663   17,2132  55=444 0          TS     V97VCNTR  FOR ENGFAIL (R41) LOGIC

1087  REF   1                17,2133  31=421 1          CAE    ETSWITCH  PREPARE SWITCHOVER COUNTER
1088  REF  80  LAST  900   17,2134  54 001 1          TS     L
1089                         17,2135  6 0000 1          DOUBLE           (COUNTER DECREMENTS EVERY 1/2 SEC)
1090  REF 191  LAST  901   17,2136  22 000 1          LXCH   A         LEM-OFF IN A, LEM-ON IN L
1091  REF  22  LAST  901   17,2137  51=447 1          INDEX  CNTR
1092  REF 192  LAST  901   17,2140  30 000 1          CAE    A
1093  REF  15  LAST  901   17,2141  6 7716 0          AD     NEGONE
1094  REF  23  LAST  901   17,2142  55=447 0          TS     CNTR      CNTR = 2(SWITCHOVER TIME, SEC) -1
1095  REF  16  LAST  690   17,2143  31=425 0 TVCINIT3  CAE    PACTOFF   TRIM VALUES TO TRIM-TRACKERS, OUTPUT
1096  REF   2  LAST  102   17,2144  55=625 0          TS     PDELOFF         TRACKERS, OFFSET-UPDATES, AND
1097  REF   4  LAST  167   17,2145  55=631 0          TS     PCMD            OFFSET-TRACKER FILTERS
1099  REF   3  LAST  655   17,2146  55=621 1          TS     DELPBAR         NOTE, LO-ORDER DELOFF,DELBAR ZEROED

1100  REF   5  LAST  667   17,2147  31=426 0          CAE    YACTOFF
1101  REF   2  LAST  102   17,2150  55=627 1          TS     YDELOFF
1102  REF   2  LAST  102   17,2151  55=632 0          TS     YCMD
1104  REF   3  LAST  655   17,2152  55=623 0          TS     DELYBAR

1111  REF  12  LAST  692   17,2153  4 1501 0 NEEDLEIN  CS     RCSFLAGS  SET BIT 3 FOR INITIALIZATION PASS AND GO
1112  REF  26  LAST  666   17,2154  7 4710 1          MASK   BIT3            TO NEEDLER.  WILL CLEAR FOR TVC DAP
1113  REF  13  LAST  901   17,2155  27=501 0          ADS    RCSFLAGS        (RETURNS AFTER CADR)
1114  REF  33  LAST  900   17,2156  0 4633 0          TC     IBNKCALL
1115  REF   5  LAST  540   17,2157   42404 1          CADR   NEEDLER

1116  REF 157  LAST  899   17,2160  3 4714 1 TVCINIT4  CAF    ZERO      SET TVCPHASE TO INDICATE TVCDAPON-THRU-
1117  REF   3  LAST  652   17,2161  55=654 0          TS     TVCPHASE        NEEDLEIN INITIALIZATION FINISHED.
A1118                                                                     (POSSIBLE TVC-RESTART ENTRY)

1119  REF  18  LAST  736   17,2162  30 032 0          CAE    CDUX      PREPARE ROLL DAP LADDERS
1120  REF   6  LAST  188   17,2163  55=672 1          TS     OGANOW
```

L TVCINITIALIZE USER'S PAGE NO. 4 E_6 S_3

A1121
A1122

ROLL DAPS RE-START UPON A RESTART, BUT RETAIN ORIGINAL CGAD (IGNOVER CDUX)

```
 11222  REF  32  LAST  627   17,2164  3 4676 1          CAF     BIT13
 11223                       17,2165  0 0006 1          EXTEND
 11224  REF  27  LAST  763   17,2166  02 011 0          RAND    DSALMOUT
 11225                       17,2167  0 0006 1          EXTEND
 11226                       17,2170  1 2173 1          BZF     +3
A11227
```

IF ENGINE IS ALREADY OFF, ENGINOFF HAS ALREADY ESTABLISHED THE POST-BURN CSMMASS (MASSBACK DOES IT). DONT TOUCH CSMMASS. IF ENGINE IS ON, THEN ITS OK TO DO THE COPYCYCLE EVEN BURNS LESS THAN 0.4SEC ARE AOK

```
 1123   REF   6  LAST  900   17,2171  31∝662 1          CAE     MASSTMP
 1124   REF  12  LAST  900   17,2172  55∝474 0          TS      CSMMASS
```

COPYCYCLE

```
 1125   REF   6  LAST  700   17,2173  3 4731 0    +3    CAF     .5SEC
 1126   REF  41  LAST  779   17,2174  0 5140 1          TC      WAITLIST
 1127   REF   3  LAST  699   E6,1742                    EBANK=  BZERO
 1128   REF   2  LAST  184   17,2175   02660 0          2CADR   TVCEXEC
 1128                       17,2176   34066 0
 1129                       17,2177  0 0006 1          EXTEND
 1130   REF   1              17,2200  3 2210 0          DCA     DAPINIT5
 1131   REF  13  LAST  900   17,2201  53∝313 0          DXCH    T5LOC
 1132   REF   4  LAST  900   17,2202  31∝635 0          CAE     T5TVCDT
 1133   REF   9  LAST  900   17,2203  54 030 0          TS      TIME5
```

CALL TVCEXECUTIVE (ROLLDAP CALL, ETC)

CALL FOR DAPINIT

(ALLOW TIME FOR RESTART COMPUTATIONS)

```
 1134   REF  29  LAST  900   17,2204  1 5222 1  ENDTVCIN TCF     RESUME
 1135                       17,2205   00101 1  NZERO    DEC     65
```

MUST BE ODD FOR MRCLEAN

```
 1136   REF  17  LAST  440      4374           NINETEEN =       VD1
```

```
 1137                       17,2206   03720 1  ONETHOU  DEC     1000 B-13
```

KG/CS B_3 TO KG/10SEC B_{16} CONVERSION

```
 1138   REF   4  LAST  902   E6,1742                    EBANK=  BZERO
 1139   REF   1              17,2207   03111 0  DAPINIT5 2CADR   DAPINIT
 1139   REF   1              17,2210   40066 0
11392   REF   5  LAST  902   E6,1742                    EBANK=  BZERO
 1140   REF   1              17,2211   02052 1  INITLOC2 2CADR   TVCINIT1
 1140   REF   1              17,2212   36066 1
```

L TVCEXECUTIVE USER=S PAGE NO. 1 E0 S3

```
R1000   PROGRAM NAME.... TVCEXECUTIVE, CONSISTING OF TVCEXEC, NEEDLEUP, VARGAINS
R1001                    REPCHEK, SWTCHOVR, CG.CORR, STRKUP, TVCEXFIN, ETC.
R1002   LOG SECTION....TVCEXECUTIVE      SUBROUTINE ....DAPCSM
R1003   MOD BY ENGEL                     DATE 23 OCT, 1987

R1004   FUNCTIONAL DESCRIPTION....

R1005       *A SELF-PERPETUATING WAITLIST TASK AT 1/2 SECOND INTERVALS WHICH'
R1006        PREPARES THE ROLL TVC DAP LADDERS
R1007        PREPARES THE ROLL FDAI NEEDLE (FLY-TO  OGA ERROR)
R1008        PREPARES THE ROLL PHASE PLANE  OGAERR  (FLY-FROM  OGA ERROR)
R1009        PREPARES THE TVC ROLLDAP TASK WAITLIST CALL (3 CS DELAY)
R1010        UPDATES THE NEEDLES DISPLAY
R1011        IMPLEMENTS VARIABLE GAINS AND VARIABLE VEHICLE MASS
R1012        PROVIDES FOR SWITCHOVER
R1013        PROVIDES FOR A SINGLE-SHOT THRUST MISALIGNMENT CORRECTION AT SWTOVR
R1014        PROVIDES FOR REPETITIVE THRUST MISALIGNMENT CORRECTIONS FOLLOWING
R1015             SWITCHOVER
R1016        PERFORMS CERTAIN STROKE TEST FUNCTIONS

R1017   CALLING SEQUENCE....

R1018       *TVCEXEC CALLED AS A WAITLIST TASK, IN PARTICULAR BY TVCINIT4 AND BY
R1019        ITSELF, BOTH AT 1/2 SECOND INTERVALS

R1020   NORMAL EXIT MODE.... TASKOVER

R1021   ALARM OR ABORT EXIT MODES.... NONE

R1022   SUBROUTINES CALLED....NEEDLER, S40.15, MASSPROP, TASKOVER, IBNKCALL

R1023   OTHER INTERFACES....

R1024       *TVCRESTART PACKAGE FOR RESTARTS
R1025       *PITCHDAP, YAWDAP FOR VARIABLE GAINS AND ENGINE TRIM ANGLES
R1026       *S40.8 FOR KPRIMEDT AT SWITCHOVER

R1027   ERASABLE INITIALIZATION REQUIRED....

R1028       *SEE TVCDAPON....TVCINIT4
R1029       *VARK AND 1/CONACC (S40.15 OF R03)
R1030       *V68 INITIALIZATION PRIOR TO SWITCHOVER OR FOLLOWING A RESTART
R1031        DURING A STROKE TEST, IF STROKE TEST FUNCTIONS ARE TO BE TESTED
R1032       *PAD LOADS EREPFRAC, ECORFRAC ETC.
R1033       *BITS 15,14 OF FLAGWRD6 (T5 BITS)
R1034       *TVCEXPHS FOR RESTARTS
R1035       *ENGINE-ON BIT (11.13) FOR RESTARTS
R1038       *CDUX, OGAD

R1037   OUTPUT....
```

```
R1038       *ROLL TVC DAP LADDERS, FDAI NEEDLE (AK), AND PHASE PLANE OGAERR
R1039       *VARIABLE GAINS FOR PITCH/YAW AND ROLL TVC DAPS
R1040       *SINGLE-SHOT AND REPETITIVE CORRECTIONS TO ENGINE TRIM ANGLES
R1041        PACTOFF AND YACTOFF
R1042       *CHANGES TO DAP SAMPLE RATES, DAP GAINS, AND STEERING-GAIN SCALING
R1043        AT (LEM-ON) SWITCHOVER
R1044       *STROKER, 4 SECONDS AFTER SWITCHOVER WHEN PRIOR V66, OR 2.5
R1045        SECONDS AFTER RESTART DURING A STROKE TEST

R1046  DEBRIS.... MUCH, BUT SHAREABLE WITH RCS/ENTRY, ALL IN EBANK6
 1047                          16,2660                          BANK    16
 1048  REF   1                 16,2000                          SETLOC  DAPROLL
 1049                          16,2660                          BANK
 1050  REF   6  LAST  902     E6,1742                          EBANK=  BZERO
 1051  REF   1                                                  COUNT*  $$/TVCX
 1052  REF  25  LAST  692     16,2660  4 0102 0  TVCEXEC      CS      FLAGWRD6      CHECK FOR TERMINATION (BITS 15,14 READ
 1053  REF  13  LAST  692     16,2661  7 4105 0                MASK    .OCT60000        10 FROM TVCDAPON TO RCSDAPON)
 1054                          16,2662  0 0006 1                EXTEND
 1055  REF   1                 16,2663  6 3142 0                BZMF    TVCEXFIN      TERMINATE

 1056  REF   7  LAST  902     16,2664  3 4731 0                CAF     .5SEC         W.L. CALL TO PERPETUATE TVCEXEC
 1057  REF  42  LAST  902     16,2665  0 5140 1                TC      WAITLIST
 1058  REF   7  LAST  904     E6,1742                          EBANK=  BZERO
 1059  REF   3  LAST  902     16,2666   02660 0                2CADR   TVCEXEC
 1059                          16,2667   34066 0

 1060  REF  19  LAST  901     16,2670  30 032 0  ROLLPREP      CAE     CDUX          UPDATE ROLL LADDERS (NO NEED TO RESTART-
 1061  REF   7  LAST  901     16,2671  57*672 0                XCH     OGANOW           PROTECT, SINCE ROLL DAPS RE-START)
 1062  REF   2  LAST  103     16,2672  57*673 1                XCH     OGAPAST

 1063  REF   2  LAST  651     16,2673  31*450 1                CAE     OGAD          PREPARE ROLL FDAI NEEDLE WITH FLY-TO
 1064                          16,2674  0 0006 1                EXTEND                   ERROR (COMMAND - MEASURED)
 1065  REF   6  LAST  904     16,2675  21*672 1                MSU     OGANOW
 1066  REF  12  LAST  539     16,2676  55*476 1                TS      AK            FLY-TO OGA ERROR, SC.AT B-1 REVS

 1067                          16,2677  0 0006 1                EXTEND                PREPARE ROLL DAP PHASE PLANE  OGAERR
 1068  REF   2  LAST  666     16,2700  7 7705 0                MP      -BIT14
 1069  REF   1                 16,2701  55*674 1                TS      OGAERR        PHASE-PLANE (FLY-FROM) OGAERROR,
A1070                                                                                    SC.AT B+0 REVS

 1071  REF  27  LAST  779     16,2702  3 6214 0                CAF     THREE         SET UP ROLL DAP TASK (ALLOW SOME TIME)
 1072  REF  43  LAST  904     16,2703  0 5140 1                TC      WAITLIST
 1073  REF   6  LAST  904     E6,1742                          EBANK=  BZERO
 1074  REF   1                 16,2704   03313 0                2CADR   ROLLDAP
 1074  REF   1                 16,2705   34066 0
 1075  REF  34  LAST  901     16,2706  0 4633 0  NEEDLEUP      TC      IBNKCALL      DO A NEEDLES UPDATE (RETURNS AFTER CADR)
 1076  REF   6  LAST  901     16,2707   42404 1                CADR    NEEDLER          (NEEDLES RESTARTS ITSELF)
```

L TVCEXECUTIVE USER=S PAGE NO. 3 E6 S3

```
1077  REP  33  LAST  902   16,2710  3 4876 1  VARGAINS CAF    BIT13      CHECK ENGINE-ON BIT TO INHIBIT VARIABLE
1078                       16,2711  0 0006 1            EXTEND             GAINS AND MASS IF ENGINE OFF
1079  REP  28  LAST  902   16,2712  02 011 0            RAND   DSALMOUT  CHANNEL 11
1080  REP 193  LAST  901   16,2713  10 000 0            CCS    A
1081                       16,2714  1 2720 1            TCF    +4             ON , SO OK TO UPDATE GAINS AND MASS
1082  REP  37  LAST  782   18,2715  3 4711 1  +5        CAF    TWO            OFF, SO BYPASS MASS/GAIN UPDATES,
10621 REP   3  LAST  652   16,2718  55=661 0            TS     TVCEXPHS             ALSO ENTRY FROM CCS BELOW WITH
10822 REP   1              16,2717  1 2750 0            TCF    SWT/COR              VCNTR = -0 (V97 R40 ENGFAIL)

10823 REP   5  LAST  901   16,2720  11=653 1            CCS    VCNTR          TEST FOR GAIN UPDATE TIME
10824                      16,2721  1 2725 1            TCF    +4                   NOT YET
10825 REP   1              16,2722  1 2731 1            TCF    GAINCHNG             NOW
108252                     16,2723  1 2723 1            TCF    +0                   NOT USED
108253 REP  1              16,2724  1 2715 1            TCF    VARGAINS +5          NO, LOTHRUST (S40.8 R40)

10826 REP   3  LAST  678   16,2725  55=663 1  +4        TS     VCNTRIMP       PROTECT VCNTR AND
10827 REP  13  LAST  902   16,2728  31=474 1            CAE    CSMMASS        CSMMASS DURING AN IMPULSIVE BURN
10828 REP   9  LAST  902   18,2727  55=862 0            TS     MASSIMP
10829 REP   1              18,2730  1 2741 0            TCF    EXECCOPY

1085  REP  35  LAST  904   18,2731  0 4633 0  GAINCHNG  TC     IBNKCALL   UPDATE IXX, IAVG, IAVG/TLX
1088  REP   1              16,2732   13243 0            CADR   PIXCW      MASSPROP ENTRY  (ALREADY INITIALIZED)
1067  REP   2  LAST  900   18,2733  0 3145 1            TC     S40.15     UPDATE 1/CONACC, VARK
1089  REP   3  LAST  900   16,2734  4 1647 1            CS     TENMDOT    UPDATE MASS FOR NEXT 10 SEC. OF BURN
1090  REP  14  LAST  905   18,2735  8 1474 1            AD     CSMMASS
1091  REP  10  LAST  905   18,2736  55=662 0            TS     MASSIMP    KG B+18

1092  REP   2  LAST  901   16,2737  3 4374 0            CAF    NINETEEN   RESET THE VARIABLE-GAIN UPDATE COUNTER
1093  REP   4  LAST  905   16,2740  55=863 1  NOUPDATE  TS     VCNTRIMP   (COUNTDOWN, FROM VARGAINS +1)

1094  REP   4  LAST  905   16,2741  25=661 1  EXECCOPY  INCR   TVCEXPHS   RESTART-PROTECT THE COPYCYCLE          (1)

1095  REP  11  LAST  905   16,2742  31=662 1            CAE    MASSIMP    CSMMASS KG B+18
1096  REP  15  LAST  905   18,2743  55=474 0            TS     CSMMASS

1097  REP   5  LAST  905   18,2744  31=883 0            CAE    VCNTRIMP   VCNTR
1098  REP   6  LAST  905   18,2745  55=853 1            TS     VCNTR
10982 REP   6  LAST  901   16,2746  55=444 0            TS     V97VCNTR   FOR ENGFAIL (R41) MASS UPDATES AT SPSOFF

1099  REP   5  LAST  905   16,2747  25=661 1            INCR   TVCEXPHS   COPYCYCLE OVER                         (2)

1100  REP  24  LAST  901   18,2750  11=447 0  SWT/COR   CCS    CNTR       CHECK FOR SWITCHOVER/CG.CORRECTION
1101                       18,2751  1 2755 0            TCF    +4             NOT YET
1102  REP   1              18,2752  1 2773 1            TCF    SWTCHOVR       NOW
1103  REP   1              18,2753  1 2761 1            TCF    REPCHEK        PRIOR SWITCHOVER (OR NONE)
1104  REP   2  LAST  905   16,2754  1 2773 1            TCF    SWTCHOVR       NOW (1/2 SEC SWITCHOVER, ONLY)

1105  REP   2  LAST  103   18,2755  55=707 1  +4        TS     CNTRIMP    COUNT DOWN
1108  REP  14  LAST  846   16,2758  3 4718 0            CAF    SEVEN      SETUP TVCEXPHS FOR ENTRY AT CNTRCOPY
1107  REP   6  LAST  905   18,2757  55=661 0            TS     TVCEXPHS
```

```
1106  REP   1                  16,2760  1 3122 1            TCF    CNTRCOPY

1109  REP   5  LAST  901      16,2761  31-652 1  REPCHEK   CAE    REPFRAC      CHECK FOR REPETITIVE UPDATES
1110                           16,2762  0 0006 1            EXTEND
1111                           16,2763  6 2770 0            BZMF   +5               NO   (NEG OR +-ZERO)
1112  REP   2  LAST  100      16,2764  55-446 1            TS     TEMPDAP +1        YES, SET UP CORRECTION FRACTION
1113  REP  22  LAST  691      16,2765  3 4715 0            CAF    FIVE                   ADVANCE TVCEXPHS
1114  REP   7  LAST  905      16,2766  55-661 0            TS     TVCEXPHS
1115  REP   1                  16,2767  1 3053 0            TCF    CORSETUP

1116  REP   1                  16,2770  3 4707 0     +5     CAF    EIGHT
1117  REP   6  LAST  906      16,2771  55-661 0            TS     TVCEXPHS
1118  REP   1                  16,2772  1 3125 0            TCF    STRKUP

1119  REP  34  LAST  905      16,2773  3 4676 1  SWTCHOVR  CAF    BIT13        CHECK ENGINE-ON BIT, NOT PERMITTING
1120                           16,2774  0 0006 1            EXTEND                    SWITCHOVER DURING ENGINE-SHUTDOWN
1121  REP  29  LAST  905      16,2775  02 011 0            RAND   DSALMOUT           TAILOFF
1122  REP 194  LAST  905      16,2776  10 000 0            CCS    A
1123                           16,2777  1 3001 1            TCF    +2           OK TO SWITCHOVER
1124  REP   2  LAST  904      16,3000  1 3142 1            TCF    TVCEXPIN     DONT SWITCHOVER, TERMINATE

11242 REP  12  LAST  900      16,3001  4 0105 1            CS     FLAGWRD9     SET SWITCHOVER FLAG (SWTOVER) FOR DWNLNK
11243 REP  37  LAST  900      16,3002  7 4674 1            MASK   BIT15              AND POST-BURN TRIM UPDATES (SEE
11244 REP  13  LAST  906      16,3003  26 105 1            ADS    FLAGWRD9           ..BESTTRIM.. (P40-P47))

1125  REP  61  LAST  900      16,3004  31-466 1            CAE    DAPDATR1     SWITCHOVER....CHECK FOR LEM-OFF/ON
1126  REP  35  LAST  906      16,3005  7 4676 0            MASK   BIT13        (NOTE, SHOWS LEM-OFF)
1127                           16,3006  0 0006 1            EXTEND
1128  REP   1                  16,3007  1 3013 1            BZF    GAINDOWN     LEM-ON....FULL SWITCHOVER/CG.CORRECTION

1129  REP  10  LAST  648      16,3010  3 4710 0            CAF    FOUR         LEM-OFF....NO SWITCHOVER, JUST CG.CORR.
1130  REP   9  LAST  906      16,3011  55-661 0            TS     TVCEXPHS
1131  REP   1                  16,3012  1 3050 0            TCF    TEMPSET

1132  REP   2  LAST  900      16,3013  31-420 0  GAINDOWN  CAE    ETVCDT/2     LEM-ON.... DROP GAIN BY (OLDTVCDT/8CS)SQ
1133                           16,3014  0 0006 1            EXTEND
1134  REP  33  LAST  888      16,3015  7 4706 0            MP     BIT5
1135  REP 195  LAST  908      16,3016  22 000 1            LXCH   A
1136                           16,3017  0 0006 1            EXTEND
1137  REP 196  LAST  906      16,3020  7 0000 0            MP     A
1138  REP 197  LAST  906      16,3021  22 000 1            LXCH   A            (TVCDT/6CS)SQD, SC.AT B+2

1139                           16,3022  0 0006 1            EXTEND       PREPARE NEW GAIN CONSTANT
1140  REP   3  LAST  900      16,3023  7 1646 0            MP     KTLX/I
1141                           16,3024  20 001 1            DDOUBL
1142                           16,3025  20 001 1            DDOUBL
1143  REP   2  LAST  103      16,3026  55-702 1            TS     TKTLX/I      (FOR COPYCYCLE)

1144  REP  10  LAST  906      16,3027  25-661 1  SWTCOPY   INCR   TVCEXPHS     RESTART-PROTECT THE COPYCYCLE        (3)
```

```
1145  REF  1                16,3030  3 7677 0        CAF   OCT37774     LEM-ON ONLY..... T5 TIMER
1146  REF  5  LAST  902     16,3031  55=635 1        TS    T5TVCDT

1150  REF  2  LAST  901     16,3032  31=414 1        CAE   KPRIME +1    PREPARE KPRIMEDT FOR 60MS DAP, USING
1151                        16,3033  6 0000 1        DOUBLE
1152                        16,3034  6 0000 1        DOUBLE
1153  REF  6  LAST  901     16,3035  55=644 1        TS    KPRIMEDT       (KPRIMEDT+1 IS ZERO)

A1154                                                                   SCALING OF OMEGAC HAS CHANGED, BUT NO
A1155                                                                       CHANGE OF REGISTERS.  RATE COMMANDS
A1156                                                                       ARE LOW BY  (OLD TVCDT)/80,  UNTIL
A1157                                                                       NEXT S40.6 COMPUTATION, WHICH USES
A1158                                                                       THE NEW  KPRIMEDT.

1159  REF  3  LAST  906     16,3036  31=702 0        CAE   TKTLX/I      GAIN CONSTANT
1160  REF  4  LAST  906     16,3037  55=646 0        TS    KTLX/I

11602 REF  3  LAST  905     16,3040  0 3154 1        TC    S40.15 +7    UPDATE VARK (ONLY, NO CHANGE 1/CONACC)

1161  REF  3  LAST  245     16,3041  11=614 1  STRKCALL CCS   STROKER     CHECK STROKER FOR VERB 66 INDICATION
1162                        16,3042  1 3047 0        TCF   +5              STROKE TEST IN PROGRESS (80MS DAP)
1163                        16,3043  1 3047 0        TCF   +4              +0 SAYS NO VERB 68 YET
1164                        16,3044  1 3047 0        TCF   +3              STROKE TEST IN PROGRESS (60MS DAP)
1165  REF  2  LAST  906     16,3045  3 4707 0        CAF   EIGHT           -0 SAYS PRIOR VERB68, SO START
1166  REF  3  LAST  901     16,3046  55=664 0        TS    STRKTIME            STROKE TEST IN 4 SECONDS

1167  REF  11 LAST  906     16,3047  25=661 1   +543 INCR  TVCEXPHS       COPYCYCLE OVER (SWTCHOVR ENTRY NEXT) (4)

1168  REF  1                16,3050  31=422 1  TEMPSET CAE   ECORFRAC       SET UP CORRECTION FRACTION
1169  REF  3  LAST  906     16,3051  55=446 1        TS    TEMPDAP +1

1170  REF  12 LAST  907     16,3052  25=661 1        INCR  TVCEXPHS       ENTRY FROM REPCHECK AT NEXT LOCATION (5)

1171  REF  62 LAST  906     16,3053  31=466 1  CORSETUP CAE   DAPDATR1     CHECK FOR LEM-OFF/ON
1172  REF  36 LAST  906     16,3054  7 4676 0        MASK  BIT13          (NOTE, SHOWS LEM-OFF)
1173                        16,3055  0 0006 1        EXTEND
1174                        16,3056  1 3060 0        BZF   +2             LEM IS ON,  PICK UP   TEMPDAP+1
1175  REF  4  LAST  907     16,3057  31=446 0        CAE   TEMPDAP +1     LEM IS OFF, PICK UP 2(TEMPDAP+1)
1176  REF  5  LAST  907     16,3060  6 1446 0        AD    TEMPDAP +1
1177  REF  6  LAST  907     16,3061  55=445 1        TS    TEMPDAP        CG.CORR USES TEMPDAP

1178  REF  16 LAST  901     16,3062  3 7716 0        CAF   NEGONE          SET UP FOR CNTR = -1 (SWTCHOVR DONE)
1179  REF  3  LAST  905     16,3063  55=707 1        TS    CNTRIMP            (COPYCYCLE AT  .CNTRCOPY. )

1180                        16,3064  0 0006 1  CG.CORR EXTEND               PITCH TRIM-TRACKER CORRECTION
1181  REF  3  LAST  901     16,3065  3 1626 1        DCA   PDELOFF
1182  REF  2  LAST  103     16,3066  53=704 1        DXCH  PACTIMP
1183  REF  17 LAST  901     16,3067  4 1425 1        CS    PACTOFF
1184  REF  4  LAST  901     16,3070  6 1621 0        AD    DELPBAR
1185                        16,3071  0 0006 1        EXTEND
```

```
1186  REF  7  LAST  907   16,3072  7 1445 1          MP      TEMPDAP
1187                      16,3073  20 001 1          DDOUBL
1188                      16,3074  20 001 1          DDOUBL
1189  REF  3  LAST  907   16,3075  21"704 1          DAS     PACTIMP

1190                      16,3076  0 0006 1          EXTEND
1191  REF  3  LAST  901   16,3077  3 1630 0          DCA     YDELOFF
1192  REF  2  LAST  103   16,3100  53"706 0          DXCH    YACTIMP
1193  REF  6  LAST  901   16,3101  4 1426 1          CS      YACTOFF
1194  REF  4  LAST  901   16,3102  6 1623 1          AD      DELYBAR
1195                      16,3103  0 0006 1          EXTEND
1196  REF  8  LAST  908   16,3104  7 1445 1          MP      TEMPDAP
1197                      16,3105  20 001 1          DDOUBL
1198                      16,3106  20 001 1          DDOUBL
1199  REF  3  LAST  908   16,3107  21"706 0          DAS     YACTIMP

1200  REF 13  LAST  907   16,3110  25"661 1  CORCOPY  INCR    TVCEXPHS    RESTART-PROTECT THE COPYCYCLE        (6)

1201                      16,3111  0 0006 1          EXTEND                TRIM-ESTIMATES, AND
1202  REF  4  LAST  908   16,3112  3 1704 0          DCA     PACTIMP
1203  REF 18  LAST  907   16,3113  55"425 1          TS      PACTOFF       TRIMS
1204  REF  4  LAST  907   16,3114  53"626 0          DXCH    PDELOFF

1205                      16,3115  0 0006 1          EXTEND
1206  REF  4  LAST  908   16,3116  3 1706 1          DCA     YACTIMP
1207  REF  7  LAST  908   16,3117  55"426 1          TS      YACTOFF
1208  REF  4  LAST  908   16,3120  53"630 1          DXCH    YDELOFF

1209  REF 14  LAST  908   16,3121  25"661 1          INCR    TVCEXPHS    COPYCYCLE OVER (SWT/COR ENTRY NEXT)  (7)

1210  REF  4  LAST  907   16,3122  31"707 0  CNTRCOPY CAE     CNTRIMP     UPDATE CNTR (RESTARTS OK, FOLLOWS CPYCY)
1211  REF 25  LAST  905   16,3123  55"447 0          TS      CNTR

1212  REF 15  LAST  908   16,3124  25"661 1          INCR    TVCEXPHS    ENTRY FROM REPCHECK AT NEXT LOCATION (8)

1213  REF  4  LAST  907   16,3125  11"664 0  STRKUP   CCS     STRKTIME    CHECK STROKE TEST START TIME
1214                      16,3126  1 3131 0          TCF     +3                IN 4SEC DELAY AFTER SWITCHOVER
1215  REF  1              16,3127  1 3133 1          TCF     STRKNOW           START STROKE TEST NOW....
1216  REF  3  LAST  906   16,3130  1 3142 1          TCF     TVCEXPIN          NO STROKE TEST REQUEST YET

1217  REF  2  LAST  103   16,3131  55"710 1          TS      STRKTIMP    COUNT DOWN
1218  REF  1              16,3132  1 3137 0          TCF     STRKTCPY

1219  REF  5  LAST  552   16,3133  31"412 1  STRKNOW  CAE     ESTROKER    START THE STROKE TEST NOW....
1220  REF  4  LAST  907   16,3134  55"614 1          TS      STROKER
1221  REF 17  LAST  907   16,3135  3 7716 0          CAF     NEGONE      KILL THE STROKE TEST CALL
1222  REF  3  LAST  908   16,3136  55"710 1          TS      STRKTIMP

1223  REF 16  LAST  908   16,3137  25"661 1  STRKTCPY INCR    TVCEXPHS    RESTART-PROTECT THE COPYCYCLE        (9)
```

```
1224  REF   4 LAST  908   16,3140  31=710 0          CAE   STRKTIMP
1225  REF   5 LAST  908   16,3141  55=664 0          TS    STRKTIME

1226  REF 158 LAST  901   16,3142  3 4714 1 TVCEXPIN CAF   ZERO       RESET TVCEXPHS
1227  REF  17 LAST  908   16,3143  55=661 0          TS    TVCEXPHS

1228  REF  45 LAST  787   16,3144  1 5213 0          TCF   TASKOVER    OVER AND OUT
```

```
P1229  NAME      S40.15 INERTIA COMPUTATIONS
 1230  REF   2  LAST  103   E6,1650                          EBANK= 1/CONACC

 1231  REF   3  LAST  691   16,3145  31∝470 0  S40.15  CAE     IXX          COMPUTE 1/CONACC (RACC)....IXX SC.AT
 1232                       16,3146  0 0006 1          EXTEND                    B+20  KG M SQD
 1233  REF   1              16,3147  7 3164 0          MP      2PI/M        2PI/M, SC.AT  1/(B+8 N M)
 1234                       16,3150  20 001 1          DDOUBL
 1235                       16,3151  20 001 1          DDOUBL
 1236                       16,3152  20 001 1          DDOUBL
 1237  REF   3  LAST  910   16,3153  55∝650 1          TS      1/CONACC     SC.AT  B+9  SEC SQD / REV

 1243  REF   5  LAST  907   16,3154  31∝646 1    +7    CAE     KTLX/I       COMPUTE VARK, SCALING IN THE KTLX/I FOR
 1244                       16,3155  0 0006 1          EXTEND                    LM-OFF,ON.  ENTRY FROM SWITCHOVER
 1245  REF   1              16,3156  7 1472 0          MP      IAVG/TLX          SCALED AT B+2  SECONDS-SQUARED
 1246                       16,3157  20 001 1          DDOUBL                    SCALING
 1247                       16,3160  20 001 1          DDOUBL
 1248                       16,3161  20 001 1          DDOUBL
 1249  REF   3  LAST  104   16,3162  55∝651 0          TS      VARK              LEM-OFF KPGEN3(0) OR LEM-ON VARK(0)

 1250  REF 176  LAST  642   16,3163  0 0002 0          TC      Q

 1251                       16,3164   33074 1  2PI/M   DEC     .00331017 B+6  2PI/M, SC.AT 1/(B+6 N M)
```

L TVCMASSPROP USER=S PAGE NO. 1 E0 S3

```
R1000   PROGRAM NAME....MASSPROP
R1001   LOG SECTION....TVCMASSPROP      PROGRAMMER...MELANSON (ENGEL, SCHLUNDT)
R1002   FUNCTIONAL DESCRIPTION'

R1003       MASSPROP OPERATES IN TWO MODES'(1)IF LEM MASS OR CONFIGURATION ARE UPDATED (MASSPROP DOES NOT TEST
R1005   FOR THIS) THE ENTIRE PROGRAM MUST BE RUN THROUGH, BREAKPOINT VALUES AND DERIVATIVES OF THE OUTPUTS WITH
R1007   RESPECT TO CSM MASS BEING CALCULATED PRIOR TO CALCULATION OF THE OUTPUTS. (2)OTHERWISE, THE OUTPUTS CAN BE
R1009   CALCULATED USING PREVIOUSLY COMPUTED BREAKPOINT VALUES AND DERIVATIVES.

R10095  CALLING SEQUENCES

R1010     IF LEM MASS OR CONFIGURATION HAS BEEN UPDATED, TRANSFER TO MASSPROP, OTHERWISE TRANSFER TO FIXCW.
R1012           L     TC     BANKCALL OR IBNKCALL
R1013           L+1   CADR   MASSPROP
R1014                 OR
R1015           L+1   CADR   FIXCW

R1016           L+2   RETURNS VIA Q

R1017   CALLED   IN PARTICULAR BY DONOUN47 (JOB) AND TVCEXECUTIVE (TASK)

R1019   JOBS OR TASKS INITIATED - NONE

R1020   SUBROUTINES CALLED - NONE

R1021   ERASABLE INITIALIZATION REQUIRED

R1022       LEMMASS MUST CONTAIN LEM MASS SCALED AT B+16 IN KILOGRAMS
R1023       CSMMASS MUST CONTAIN CSM MASS SCALED AT B+16 IN KILOGRAMS

R1024       DAPDATR1 MUST BE SET TO INDICATE VEHICLE CONFIGURATION.
R10241              BITS (15,14,13)  =  ( 0 , 0 , 1 )    LEM OFF
R102411                                ( 0 , 1 , 0 )    LEM ON (ASCNT,DSCNT)
R102412                                ( 1 , 1 , 0 )    LEM ON (ASCNT ONLY)
R1025   ALARMS - NONE

R1026   EXIT -   TC     Q

R1027   OUTPUTS'

R1028       (1)IXX, SINGLE PRECISION SCALED AT B+20 IN KG-M SQ.
R1029       (2)IAVG, SINGLE PRECISION SCALED AT B+20 IN KG-M SQ.
R1030       (3)IAVG/TLX, SINGLE PRECISION, SCALED AT B+2 SEC-SQD
R1031       THEY ARE STORED IN CONSECUTIVE REGISTERS IXX0, IXX1, IXX2

R10311      CONVERSION FACTOR ' (SLUG-FTSQ) = 0.737562 (KG-MSQ)
```

R1032 OUTPUTS ARE CALCULATED AS FOLLOWS '

R1033 (1) IF LEM DOCKED, LEMMASS IS FIRST ELIMINATED AS A PARAMETER

R1034 VARST0 = INTVALUE0 + LEMMASS(SLOPEVAL0) IXX BREAKPOINT VALUE
R1036 VARST1 = INTVALUE1 + LEMMASS(SLOPEVAL1) IAVG BREAKPOINT VALUE
R1038 VARST2 = INTVALUE2 + LEMMASS(SLOPEVAL2) IAVG/TLX BREAKPOINT VALUE

R1040 VARST3 = INTVALUE3 + LEMMASS(SLOPEVAL3) IAVG/TLX SLOPE FOR CSMMASS δ 33956 LBS (SPS δ 10000 LBS)
R1042 VARST4 = INTVALUE4 + LEMMASS(SLOPEVAL4) IAVG SLOPE FOR CSMMASS δ 33956 LBS (SPS δ 10000 LBS)

R1044 VARST5 = INTVALUE5 + LEMMASS(SLOPEVAL5) IXX SLOPE FOR ALL VALUES OF CSMMASS

R1046 VARST6 = INTVALUE6 + LEMMASS(SLOPEVAL6) IAVG SLOPE FOR CSMMASS ± 33956 LBS (SPS ± 10000 LBS)
R1048 VARST7 = INTVALUE7 + LEMMASS(SLOPEVAL7) IAVG/TLX SLOPE FOR CSMMASS ± 33956 LBS (SPS ± 10000 LBS)

R1050 VARST8 = INTVALUE8 + LEMMASS(SLOPEVAL8) IAVG DECREMENT TO BRKPT VALUE WHEN LEM DSCNT STAGE OFF
R1052 VARST9 = INTVALUE9 + LEMMASS(SLOPEVAL9) IAVG/TLX DECREMENT TO BRKPT VALUE WHEN LEM DSCNT STAGE OFF
R1054 (2) IF LEM NOT DOCKED

R1055 VARST0 = NOLEMVAL0 WHERE THE MEANING AND SCALING OF VARST0
R1056 . . TO VARST9 ARE THE SAME AS GIVEN ABOVE
R1057 . .
R1058 . . NOTE... FOR THIS CASE, VARST8,9 HAVE NO
R1059 VARST9 = NOLEMVAL9 MEANING (THEY ARE COMPUTED BUT NOT USED)
R1060 (3) THE FINAL OUTPUT CALCULATIONS ARE THEN DONE

R1061 IXX0 = VARST0 + (CSMMASS + NEGBPW)VARST5 IXX

R1062 IXX1 = VARST1 + (CSMMASS + NEGBPW)VARST(4 OR 6) IAVG

R1063 IXX2 = VARST2 + (CSMMASS + NEGBPW)VARST(3 OR 7) IAVG/TLX
R1064 THE DATA USED CAME FROM CSM/LM SPACECRAFT OPERATIONAL DATA BOOK.
R10641 VOL. 3, NASA DOCUMENT SNA-8-D-027 (MARCH 1968)

R1065 PERTINENT MASS DATA ' CSM WEIGHT (FULL) 64100 LBS.
R1066 (EMPTY) 23956 LBS
R1067 LEM WEIGHT (FULL) 32000 LBS
R1068 (EMPTY) 14116 LBS

R10681 (WEIGHTS ARE FROM AMENDMENT $\int$1 (APRIL 24,1968) TO ABOVE DATA BOOK)

```
1069                        25,3766                         BANK    25
1070   REF   1              05,2000                         SETLOC  DAPMASS
1071                        05,3207                         BANK
1072   REF   9  LAST  904   E6,1742                         EBANK=  BZERO
1073   REF   1                                             COUNT*  $$/MASP
1074   REF   2  LAST  439   05,3207  3 4334 1  MASSPROP    CAF     NINE        MASSPROP USES TVC/RCS INTERUPT TEMPS
1075   REF   2  LAST  101   05,3210  55=506 1              TS      PHI333      SET UP TEN PASSES

1076   REF  63  LAST  907   05,3211  31=466 1  LEMTEST     CAE     DAPDATR1    DETERMINE LEM STATUS
1077   REF  37  LAST  907   05,3212  7 4676 0              MASK    BIT13
1078                        05,3213  0 0006 1              EXTEND
1079   REF   1              05,3214  1 3220 0              BZF     LEMYES

1080   REF   3  LAST  913   05,3215  51=506 0  LEMNO       INDEX   PHI333      LEM NOT ATTACHED
1081   REF   1              05,3216  3 3304 0              CAF     NOLEMVAL
1082   REF   1              05,3217  1 3230 1              TCF     STOINST

1083   REF   5  LAST  274   05,3220  31=473 0  LEMYES      CAE     LEMMASS     LEM IS ATTACHED
1084                        05,3221  6 0000 1              DOUBLE
1085                        05,3222  0 0006 1              EXTEND
1086   REF   4  LAST  913   05,3223  5 1506 0              INDEX   PHI333
1087   REF   1              05,3224  7 3326 1              MP      SLOPEVAL
1088                        05,3225  20 001 1              DDOUBL
1089   REF   5  LAST  913   05,3226  51=506 0              INDEX   PHI333
1090   REF   1              05,3227  6 3314 1              AD      INTVALUE

1091   REF   6  LAST  913   05,3230  51=506 0  STOINST     INDEX   PHI333      STORAGE INST BEGIN HERE
1092   REF   3  LAST  101   05,3231  55=511 1              TS      VARST0
1093   REF   7  LAST  913   05,3232  11=506 1              CCS     PHI333      ARE ALL TEN PASSES COMPLETED
1094   REF   5  LAST  900   05,3233  1 3210 0              TCF     MASSPROP +1 NO - GO DECREMENT PHI333

1096   REF  64  LAST  913   05,3234  11=466 0  DXTEST      CCS     DAPDATR1    IF NEG, BIT15 IS 1, LEM DSCNT STAGE OFF
1099   REF   2  LAST  905   05,3235  1 3243 0              TCF     PIXCW
1100   REF   3  LAST  913   05,3236  1 3243 0              TCF     PIXCW
1101   REF   4  LAST  913   05,3237  53=522 1              DXCH    VARST0 +8D
1102   REF   5  LAST  913   05,3240  21=513 0              DAS     VARST0 +1
1103   REF   1              05,3241  3 3341 1              CA      DXITPIX
1104   REF   6  LAST  913   05,3242  27=520 0              ADS     VARST0 +7

1105   REF  35  LAST  900   05,3243  3 4711 1  PIXCW      CAF     BIT2        COMPUTATION PHASE BEGINS HERE.  SET UP
1106   REF   6  LAST  913   05,3244  55=506 1              TS      PHI333      THREE PASSES
1107   REF   2  LAST  101   05,3245  55=507 0              TS      PSI333

1108   REF  16  LAST  905   05,3246  31=474 1              CAE     CSMMASS     GET DELTA CSM WEIGHT - SIGN DETERMINES
1109   REF   1              05,3247  6 3340 0              AD      NEGRPW      SLOPE LOCATIONS.
1110                        05,3250  6 0000 1              DOUBLE
1111   REF   2  LAST  101   05,3251  55=510 0              TS      TEMP333
```

```
1112                          05,3252  0 0006 1           EXTEND
1113  REF   1                 05,3253  6 3256 0           BZMF    PEGGY       DETERMINE CORRECT SLOPE
1114  REF   3  LAST  316      05,3254  3 7715 0           CAF     NEG2
1115  REF   9  LAST  913      05,3255  55,506 1           TS      PHI333

1116  REF  10  LAST  914      05,3256  51,506 0  PEGGY    INDEX   PHI333      ALL IS READY - CALCULATE OUTPUTS NOW
1117  REF   1                 05,3257  31,516 1           CAE     VARST5      GET SLOPE
1116                          05,3260  0 0006 1           EXTEND
1119  REF   3  LAST  913      05,3261  7 1510 0           MP      TEMP333     MULT BY DELTA CSM WEIGHT
1120                          05,3262  6 0000 1           DOUBLE
1121  REF   3  LAST  913      05,3263  51,507 1           INDEX   PSI333
1122  REF   7  LAST  913      05,3264  6 1511 0           AD      VARST0      ADD BREAKPOINT VALUE
1123  REF   4  LAST  914      05,3265  51,507 1           INDEX   PSI333
1124  REF   4  LAST  910      05,3266  55,470 1           TS      IXX         ****** OUTPUTS (IXX0, IXX1, IXX2) ******
1125  REF   5  LAST  914      05,3267  11,507 0           CCS     PSI333      BOOKKEEPING - MASSPROP FINISHED OR NOT
1126  REF   1                 05,3270  1 3300 0           TCF     BOKKEP2     NO - GO TAKE CARE OF INDEXING REGISTERS

1127  REF  65  LAST  913      05,3271  31,466 1           CAE     DAPDATR1    UPDATE WEIGHT/G
1128  REF  45  LAST  900      05,3272  7 4675 0           MASK    BIT14
1129  REF 196  LAST  906      05,3273  10 000 0           CCS     A
1130  REF   6  LAST  913      05,3274  3 1473 0           CA      LEMMASS
1131  REF  17  LAST  913      05,3275  6 1474 1           AD      CSMMASS
1132  REF   9  LAST  849      05,3276  55,475 1           TS      WEIGHT/G    SCALED AT B+16 IN KILOGRAMS
1133  REF 179  LAST  910      05,3277  0 0002 0  ENDMASSP TC      Q

1134  REF   6  LAST  914      05,3300  55,507 0  BOKKEP2  TS      PSI333      REDUCE PSI BY ONE
1135                          05,3301  0 0006 1           EXTEND
1136  REF  11  LAST  914      05,3302  27,506 1           DIM     PHI333
1137  REF   2  LAST  914      05,3303  1 3256 1           TCF     PEGGY
```

```
1138                05,3304  00616 0  NOLEMVAL DEC    25445. B-20
1139                05,3305  02526 1           DEC    87450. B-20
1140                05,3306  02352 1           DEC    .30715 B-2
1141                05,3307  01471 1           DEC    1.22877 E-5 B+12
1142                05,3310  00634 0           DEC    1.6096 B-6
1143                05,3311  00612 1           DEC    1.54 B-6
1144                05,3312  03706 0           DEC    7.77177 B-6
1145                05,3313  04425 0           DEC    3.46456 E-5 B+12

1146                05,3314  00644 1  INTVALUE DEC    26650 B-20
1147                05,3315  03710 1           DEC    127516 B-20
1148                05,3316  04246 0           DEC    .54059 B-2
1149                05,3317  02011 0           DEC    .153964 E-4 B+12
1150                05,3320  77501 0           DEC    -.742923 B-6
1151                05,3321  00612 1           DEC    1.5396 B-6
1152                05,3322  04656 0           DEC    9.66 B-6
1153                05,3323  10372 0           DEC    .647625 E-4 B+12
1154                05,3324  77126 1           DEC    -27226. B-20
1155                05,3325  76261 0           DEC    -.206476 B-2

1156                05,3326  00767 1  SLOPEVAL DEC    1.96307 B-6
1157                05,3327  15624 0           DEC    27.5774 B-6
1158                05,3330  03054 0           DEC    2.3546 E-5 B+12
1159                05,3331  04532 1           DEC    2.1777 E-9 B+26
1160                05,3332  10433 1           DEC    1.044 E-3 B+8
1161                05,3333  00000 1           DEC    0
1162                05,3334  22070 0           DEC    2.21066 E-3 B+6
1163                05,3335  03204 1           DEC    1.5166 E-9 B+26
1164                05,3336  77266 0           DEC    -1.264 B-6
1165                05,3337  02476 0           DEC    2. E-5 B+12

1166                05,3340  70364 1  NEGBPW   DEC    -15402.17 B-16
1167                05,3341  75420 0  DXITFIX  DEC*   -1.66275 E-5 B+12*
```

L TVCRESTARTS USER=S PAGE NO. 1 E0 S3

R1000 NAME....TVCRESTART PACKAGE, CONSISTING OF RSDOTVC, ENABL1, 2, CMDSOUT, PHSCHK2, ETC.
R1002 LOG SECTION....TVCRESTART PACKAGE SUBROUTINE....DAPCSM
R1003 MOD BY ENGEL DATE....19 OCT, 1967

R1004 FUNCTIONAL DESCRIPTION....

R1005 *RESTART-PROOFS THE TVC DAPS, INCLUDING PITCHDAP, YAWDAP,
R1006 TVCEXECUTIVE, ROLL DAP, TVCINIT4, TVCDAPON, AND STROKE TEST
R1007 *TVC RESTARTS RECEIVE SPECIAL CONSIDERATION IN SEVERAL AREAS.
R1008 RESTART DOWN-TIME IS IMPORTANT BECAUSE OF THE TRANSIENTS INTRODUCED
R1009 BY THE THRUST VECTOR RETURN TO THE ACTUATOR MECHANICAL NULLS
R1010 FOLLOWING TVC- AND OPTICS-ERROR-COUNTER-DISABLES (CHANNEL 12).
R1011 TVC USES A MIXTURE OF WAITLIST, T5, T6, AND JOB CALLS. THERE IS
R1012 FILTER MEMORY (UP TO 7TH ORDER) TO BE PROTECTED IF WILD TRANSIENTS
R1013 ARE TO BE AVOIDED. SEVERAL COUNTERS ARE INVOLVED FOR TIMING TVC
R1014 EVENTS SUCH AS SWITCHOVER AND STROKE TEST STARTUPS AND RE-STARTUPS.
R1015 THE TVC GAINS ARE DECREMENTED. THE GIMBAL TRIM ESTIMATORS AND THE
R1016 BODY AXIS ATTITUDE ERROR INTEGRATORS INVOLVE DIGITAL SUMMATION.
R1017 DIGITAL DIFFERENTIATORS ARE INVOLVED IN THE BODY AXIS RATE ESTIMA-
R1018 TIONS AND IN THE OUTPUTTING OF ACTUATOR COMMANDS. THERE IS AN
R1019 OFFSET-TRACKER-FILTER TO PROTECT. ETC., ETC.
R1020 *THOSE QUANTITIES WHICH MUST BE PROTECTED ARE STORED IN TEMPORARY
R1021 REGISTERS AS THEY ARE COMPUTED, FOR UPDATING THE REAL REGISTERS
R1022 DURING COPYCYCLES.
R1023 *THE SEVERAL COPYCYCLES ARE EACH PROTECTED BY PHASE POINTS AT THEIR
R1024 BEGINNING AND AT THEIR TERMINATION. THE PHASE POINTS ARE SIMPLY
R1025 ..INCR.. INSTRUCTIONS, EITHER ..INCR TVCEXPHS.. FOR COPYCYCLES
R1026 IN THE TVCEXECUTIVE, OR ..INCR TVCPHASE.. FOR THE PITCH AND YAW
R1027 COPYCYCLES. INDEXING ON EACH OF THESE POINTERS THEN PERMITS A
R1028 RETURN TO THE APPROPRIATE RESTART POINTS.
R1029 *IF A RESTART OCCURS DURING EITHER COPYCYCLE, THAT COPYCYCLE IS
R1030 COMPLETED. THEN THE NORMAL TVCINIT4....DAPINIT....PITCHDAP STARTUP
R1031 SEQUENCE IS CALLED UPON TO GET THINGS GOING AGAIN.
R1032 *TVC-ENABLE AND OPTICS-ERROR-COUNTER ENABLE MUST BE SET ASAP
R1033 (ALLOWING FOR PROCEDURAL DELAYS). THEN THE ENGINES ARE COMMANDED
R1034 TO THE P,YACTCOM TRIM VALUES. THE DAPS ARE THEN READY TO GO ON THE
R1035 AIR, WITH THE REGULAR STARTUP SEQUENCE, EITHER AT MRCLEAN FOR A
R1036 COMPLETE INITIALIZATION OR AT TVCINIT4 FOR A PARTIAL INITIALIZATION
R1037 *FOR RESTARTS PRIOR TO THE SETTING OF THE T5 BITS IN IGNOVER THE
R1038 PRE40.6 SECTION OF S40.6 TAKES CARE OF RE-ESTABLISHING TRIMS.
R1039 *IF A RESTART OCCURS DURING THE TVCEXEC....TVCEXFIN SEQUENCE THE
R1040 COMPUTATIONS WILL BE COMPLETED, STARTING AT THE APPROPRIATE RESTART
R1041 POINT, AFTER THE DAPS ARE READY TO GO ON THE AIR.
R1042 *IF A RESTART OCCURS PRIOR TO TVCINIT4 (TVCPHASE = -1) E.G. DURING
R1043 THE EARLY DAP INITIALIZATION PHASE, THE DAP STARTUP SEQUENCE IS
R1044 ENTERED AT MRCLEAN FOR A FULL INITIALIZATION.
R1045 *RESTARTS ARE NOT CRITICAL TO THE ROLL DAP PERFORMANCE; HENCE THE
R1046 THE ROLL DAP IS MERELY RESTARTED.
R1050 *RESTARTS DURING A STROKE TEST (STROKER IS NON-ZERO) WILL CAUSE THE
R1051 STROKE TEST TO BE TERMINATED. A NEW V68 ENTRY WILL BE REQUIRED

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R1052          TO GET IT GOING AGAIN (NO AUTOMATIC RESTART).
R1054         *REDOTVC IS REACHED FOLLOWING ANY RESTART WHICH FINDS THE T5 BITS
R1055          (BITS 15,14 OF FLAGWRD8) SET FOR TVC. IGNOVER PREPARES TVCPHASE =-1
R1056          AND TVC EXPHS = 0 JUST BEFORE SETTING THESE BITS, JUST BEFORE
R1057          MAKING THE T5 CALL TO TVCDAPON.  T.V.N.G. TAKES OVER THE T5 CLOCK
R1058          TO CALL RCSUP/RCSDAPON WHICH RESETS THE T5 BITS(FOR RCS) ON A
R1059          NORMAL SHUTDOWN.

R1060     CALLING SEQUENCE....T5, IN PARTICULAR BY ELRSKIP OF FRESH START/RESTART

R1061     NORMAL EXIT MODES....RESUME, NOORSM, POSTJUMP (TO TVCINIT4 OR MRCLEAN)

R1062     ALARM OR ABORT EXIT MODES....NONE

R1063     SUBROUTINES CALLED....

R1064          *PCOPY+1, YCOPY+1 (PITCH AND YAW COPYCYCLES)
R1065          *ENABLE1,2, CMDSOUT (RE-ESTABLISH ACTUATOR TRIMS)
R1067          *MRCLEAN OR TVCINIT4 (TVCDAP INITIALIZATIONS)
R1068          *EXRSTRT AND TVCEXECUTIVE PHASE POINTS 1 THRU 9
R1069          *WAITLIST, IBNKCALL, POSTJUMP, ISWCALL

R1070     OTHER INTERFACES....IGNOVER AND RCSDAPON (T5 BITS), ELRSKIP (CALLS IT)

R1071     ERASABLE INITIALIZATION REQUIRED....

R1072          *T5 BITS, TVCPHASE, TVCEXPHS
R1073          *TVC DAP VARIABLES
R1074          *OPERATIONS PERFORMED BY REDOTVC ARE BASED ON THE ASSUMPTION THAT
R1075           THE TVC DAPS ARE RUNNING NORMALLY

R1076     OUTPUT....

R1077          *PITCH AND YAW TVC DAP COPYCYCLES COMPLETED IF INTERUPTED
R1078          *TVCEXECUTIVE COMPLETED IF INTERUPTED
R1079          *STROKE TEST TERMINATED IF INTERRUPTED
R1080          *ACTUATOR TRIMS RE-ESTABLISHED (ACTUATORS BACK ON THE AIR)
R1081          *TVC DAP INITIALIZATION AS REQUIRED
R1082          *ALL TVC DAP OPERATIONS ON THE AIR

R1083     DERIS....TVC TEMPORARIES IN EBANK6
 1084                              16,3165                    BANK    16
 1085     REF   2  LAST  904       16,2000                    SETLOC  DAPROLL
 1086                              16,3165                    BANK
 1087     REF   4  LAST  901       E6,1654                    EBANK=  TVCPHASE

 1088     REF   1                                             COUNT*  $$/RSRT
 1089     REF   9  LAST  900  16,3165  22 016 0  REDOTVC     LXCH    BANKRUPT        TVC RESTART PACKAGE
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1090                          16,3166  0 0006 1              EXTEND
1091  REP   9  LAST  900      16,3167  22 012 1              QXCH   QRUPT        (  ..TCR..  IN  ..FINCOPY..  )

1092  REP  16  LAST  909      16,3170  11=661 0  EXECPHS      CCS    TVCEXPHS     CHECK TVCEXECUTIVE PHASE
1093                          16,3171  1 3173 0              TCF    +2                MUST RESTART TVCEXECUTIVE
1094  REP   1                 16,3172  1 3177 1              TCF    TVCDAPHS          NO NEED TO RESTART TVCEXECUTIVE

1095  REP   3  LAST  913      16,3173  3 4334 1              CAF    NINE         9CS DELAY TO FORCE EXRSTRT TO OCCUR
1096  REP  44  LAST  904      16,3174  0 5140 1              TC     WAITLIST          BEFORE PITCHDAP, AFTER CMDSOUT
1097  REP  19  LAST  916      E6,1661                        EBANK= TVCEXPHS
1098  REP   1                 16,3175   03271 0              2CADR  EXRSTRT
1098  REP   1                 16,3176   34066 0

1099  REP   2  LAST  133      16,3177  4 7700 0  TVCDAPHS    CS     OCT37776     CHECK BITS 15 AND 1 OF TVCPHASE TO SEE
1100  REP   5  LAST  917      16,3200  7 1654 0              MASK   TVCPHASE          DAP RESTART LOCATION  (-1,1,2,3)
1101  REP 199  LAST  914      16,3201  10 000 0              CCS    A
1102  REP   1                 16,3202  1 3256 1              TCF    FINCOPY           FINISH THE COPYCYCLE FIRST
1103  REP   1                 16,3203  1 3205 1              TCF    ENABL1            JUST PREPARE THE OUTCOUNTERS AND GO
1104  REP   1                 16,3204  1 3262 0              TCF    TRIM/CMD          (RE-)DO P,YCMD INITIALIZATION FIRST
1105  REP  24  LAST  611      16,3205  3 4703 1  ENABL1      CAF    BIT8         TVC ENABLE, FOLLOWED BY 40 MS (MIN) WAIT
11052 REP  24  LAST  640      16,3206  6 4700 1              AD     BIT11             OPTICS DAC DISENGAGE TOO
1106                          16,3207  0 0006 1              EXTEND                   (ENABL1 ENTRIES..+0,- CCS, FINCOPY)
1107  REP  31  LAST  690      16,3210  05 012 1              WOR    CHAN12
1108  REP   1                 16,3211  3 3275 1              CAF    TVCADDR      WAIT,  CALLING ENABL2  (BBCON THERE)
1109  REP  14  LAST  902      16,3212  55=312 1              TS     T5LOC
1110  REP   2  LAST  916      16,3213  3 3301 0              CAF    TVCADDR +4        60MS  (TVCEXADR)
1111  REP  10  LAST  902      16,3214  54 030 0              TS     TIME5

1112  REP  30  LAST  902      16,3215  1 5222 1              TCF    RESUME
1113  REP  10  LAST  917      16,3216  22 016 0  ENABL2      LXCH   BANKRUPT     CONTINUE PREPARATION OF OUTCOUNTERS

1114  REP  36  LAST  913      16,3217  3 4711 1              CAF    BIT2         OPTICS ERROR CNTR ENABLE, 4MS MIN WAIT
1115                          16,3220  0 0006 1              EXTEND
1116  REP  32  LAST  916      16,3221  05 012 1              WOR    CHAN12
1117  REP   3  LAST  916      16,3222  3 3277 0              CAF    TVCADDR +2   WAIT, CALLING CMDSOUT (BBCON THERE)
1118  REP  15  LAST  916      16,3223  55=312 1              TS     T5LOC
1119  REP   3  LAST  918      16,3224  3 7700 1              CAF    OCT37776          20MS
1120  REP  11  LAST  916      16,3225  54 030 0              TS     TIME5

1121  REP   2  LAST  166      16,3226  1 5224 1              TCF    NOORSM
1122  REP  11  LAST  916      16,3227  22 016 0  CMDSOUT     LXCH   BANKRUPT     CONTINUE PREPARATION OF OUTCOUNTERS
1123                          16,3230  0 0006 1              EXTEND
1124  REP  10  LAST  916      16,3231  22 012 1              QXCH   QRUPT
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1125   REF 159  LAST 909   16,3232  4 4714 0          CS    ZERO      MOST RECENT ACTUATOR COMMANDS
1126   REF   5  LAST 901   16,3233  6 1631 1          AD    PCMD      (AVOID +0)
1127   REF   3  LAST 667   16,3234  54 054 1          TS    TVCPITCH
1128   REF 160  LAST 919   16,3235  4 4714 0          CS    ZERO
1129   REF   3  LAST 901   16,3236  6 1632 1          AD    YCMD
1130   REF   2  LAST 667   16,3237  54 053 0          TS    TVCYAW

1131   REF   3  LAST 667   16,3240  3 4755 1          CAF   PRIO6     RELEASE THE COUNTERS (BITS 11,12)
1132                       16,3241  0 0006 1          EXTEND
1133   REF   7  LAST 667   16,3242  05 014 1          WOR   CHAN14

1136   REF   6  LAST 918   16,3243  4 1654 0  PHSCHK2 CS    TVCPHASE  CHECK TVCPHASE AGAIN
1139                       16,3244  0 0006 1          EXTEND
1140                       16,3245  6 3250 0          BZMF  +3
1141   REF  46  LAST 626   16,3246  0 4574 0          TC    POSTJUMP      IF NEGATIVE, RESTART AT MRCLEAN
1142   REF   2  LAST 699   16,3247  36033 1           CADR  MRCLEAN           FOR FULL INITIALIZATION

11421  REF   5  LAST 908   16,3250  11-614 1  CHKSTRK CCS   STROKER  CHECK FOR STROKE TEST IN PROGRESS
11422  REF   1             16,3251  1 3266 1          TCF   TSTINITJ  YES, KILL IT
11423                      16,3252  1 3254 0          TCF   +2        NO, PROCEED
11424  REF   2  LAST 919   16,3253  1 3266 1          TCF   TSTINITJ  YES, KILL IT

1143   REF  49  LAST 919   16,3254  0 4574 0    +4    TC    POSTJUMP      IF POSITIVE OR ZERO, RESTART AT
1144   REF   1             16,3255  36160 0           CADR  TVCINIT4          TVCINIT4 (ZEROS TVCPHASE, AND
A1145                                                                       CALLS TVC DAPS)
1146   REF   7  LAST 919   16,3256  51-654 1  PINCOPY  INDEX TVCPHASE PICK UP THE APPROPRIATE COPYCYCLE
1147   REF   1             16,3257  3 3275 1          CAF   TVCCADR
1148   REF   1             16,3260  0 4637 1          TCR   ISWCALL   RE-ENTER THE COPYCYCLE, RETURN AT END
1149   REF   2  LAST 918   16,3261  1 3205 1          TCF   ENABL1    NOW PREPARE THE OUTCOUNTERS
1150                       16,3262  0 0006 1  TRIM/CMD EXTEND        TVCDAPON INITIALIZATION NOT COMPLETED,
1151   REF  19  LAST 906   16,3263  3 1426 0          DCA   PACTOFF       EG. P,YCMD MAY NOT BE SET.  SET...
1152   REF   6  LAST 919   16,3264  53-632 0          DXCH  PCMD
1153   REF   3  LAST 919   16,3265  1 3205 1          TCF   ENABL1    NOW PREPARE THE OUTCOUNTERS
1154   REF 161  LAST 919   16,3266  3 4714 1  TSTINITJ CAF  ZERO      DISABLE STROKE TEST (-0 SHOWS PRIOR V66)
1155   REF   6  LAST 919   16,3267  55-614 1          TS    STROKER   (+0 MEANS NEW V66 REQUIRED FOR STARTUP)
11552  REF   1             16,3270  1 3254 0          TCF   CHKSTRK +4

1161   REF  20  LAST 916   16,3271  51-661 1  EXRSTRT  INDEX TVCEXPHS  TVCEXECUTIVE RESTARTS....GO TO
1162   REF   1             16,3272  3 3301 0          CAF   TVCEXADR      APPROPRIATE RESTART POINT
1163   REF 200  LAST 916   16,3273  50 000 1          INDEX A
1164                       16,3274  1 0000 0          TCF   0
```

R1165 TVC RESTART TABLES.... ORDER IS REQUIRED. HI-ORDER WORDS ONLY, OF 2CADRS, SINCE BBCON IS ALREADY THERE.

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1167  REP  2  LAST  919   16,3275                TVCADDR  =       TVCCADR          TABLE OF CADRS, UNUSED LOCS FOR GENADRS
1168  REP  1               16,3275   03216 1     TVCCADR  GENADR  ENABL2          (FOR T5 CALL, UNUSED TABLE LOC)
1169  REP  1               16,3276   40561 1       +1     CADR    PCOPY +1        PITCH COPYCYCLE
1170  REP  1               16,3277   03227 0       +2     GENADR  CMDSOUT         (FOR T5 CALL, UNUSED TABLE LOC)
1171  REP  1               16,3300   41037 0       +3     CADR    YCOPY +1        YAW COPYCYCLE
1172                       16,3301   37772 1     TVCEXADR OCT     37772           (UNUSED TABLE LOC, FILL WITH 60MS, T5)
1173  REP  2  LAST  905    16,3302   02742 1       +1     GENADR  EXECCOPY +1     TVCEXECUTIVE RESTART POINTS (ORDERED)
1174  REP  2  LAST  905    16,3303   02750 1       +2     GENADR  SWT/COR
1175  REP  1               16,3304   03030 1       +3     GENADR  SWTCOPY +1
1176  REP  2  LAST  906    16,3305   03050 1       +4     GENADR  TEMPSET
1177  REP  2  LAST  906    16,3306   03053 1       +5     GENADR  CORSETUP
1178  REP  1               16,3307   03111 0       +6     GENADR  CORCOPY +1
1179  REP  2  LAST  906    16,3310   03122 0       +7     GENADR  CNTRCOPY
1180  REP  2  LAST  906    16,3311   03125 1       +8D    GENADR  STRKUP
1181  REP  2  LAST  908    16,3312   03140 1       +9D    GENADR  STRKTCPY +1
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L TVCDAPS USER=S PAGE NO. 1 E0 S3

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R1000   PROGRAM NAME....TVCDAP, CONSISTING OF PITCHDAP, YAWDAP, ETC.
R1001   LOG SECTION....TVCDAP          SUBROUTINE....DAPCSM
R1002   MOD BY ENGEL                   DATE....27 OCT, 1967

R1003   FUNCTIONAL DESCRIPTION....

R1004         SELF-PERPETUATING T5 TASKS WHICH GENERATE THE COMMAND SIGNALS
R1005         FOR THE PITCH AND YAW SPS GIMBAL ACTUATORS DURING TVC (SPS) BURNS,
R1006         IN RESPONSE TO BODY-AXIS RATE COMMANDS FROM CROSS-PRODUCT STEERING
R1007         (S40.8).  IF NO STEERING (IMPULSIVE BURNS) MAINTAINS ATTITUDE-HOLD
R1008         ABOUT THE REFERENCE (INITIAL) DIRECTIONS (ZERO RATE COMMANDS).

R1009         THE PITCH AND YAW LOOPS ARE SEPARATE, BUT STRUCTURED IDENTICALLY.
R1010         EACH ATTITUDE-RATE LOOP INCLUDES GIMBAL ANGLE RATE DERIVATION,
R1011         GIMBAL/BODY AXIS TRANSFORMATION, BODY-AXIS ATTITUDE ERROR
R1012         INTEGRATION WITH ERROR LIMITING, THE CSM/LEM FILTER  OR THE BRANCH
R1013         POINTS FOR THE CSM-ALONE (GEN3DAP) FILTER,  OUTPUT LIMITER,
R1014         CG-OFFSET TRACKER FILTER, AND THE CG-TRACKER MINOR LOOP.

R1015         THE DAPS ARE CYCLIC, CALLING EACH OTHER AT 1/2  THE DAP SAMPLE
R1016         TIME, AS DETERMINED BY T5TVCDT.  THE ACTUATOR COMMANDS ARE
R1017         REGENERATED AS ANALOG VOLTAGES BY THE OPTICS ERROR COUNTERS, WHICH
R1018         TRANSMIT THE SIGNAL TO THE ACTUATOR SERVOS WHEN THERE IS PROPER CDU
R1019         MODING.

R1020         REFERENCES FOR THE CSM/LEM FILTER DESIGN INCLUDE R503 BY  STUBBS
R1021         (MIT IL OCT 1965) AND SGA MEMO R26-65 BY MARTIN (MIT IL OCT 1965).
R1022         REFERENCES FOR THE CSM FILTER DESIGN (SEE GEN3DAP) INCLUDE R533 BY
R1023         LU  (MIT IL JUNE 1966).

R1024         OPERATIONAL ASPECTS OF THE INTEGRATED CONTROL PACKAGE, WITH DESIGN-
R1025         NOMINAL PARAMETER VALUES ARE DISCUSSED IN AG R336-67 BY ENGEL
R1026         (MIT IL OCT 1967) AND SGA MEMO R18-67 BY SCHLUNDT (MIT IL OCT 1967)

R1027   CALLING SEQUENCE.... (TYPICALLY)

R1028         T5 CALL OF TVCDAPON (P40-P47) BY IGNOVER (P40-P47)
R1029         T5 CALL OF DAPINIT BY TVCINIT4 (P40-P47)
R1030         T5 CALL OF DAPINIT BY DAPINIT
R1031         T5 CALL OF PITCHDAP BY DAPINIT
R1032         T5 CALL OF YAWDAP BY PITCHDAP
R1033         T5 CALL OF PITCHDAP BY YAWDAP
R1034               ETC.
R1035         (AUTOMATIC SEQUENCING FROM TVCDAPON)

R1036   NORMAL EXIT MODE....RESUME

R1037   ALARM OR ABORT EXIT MODES....NONE

R1038   SUBROUTINES CALLED....
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R1039           HACK FOR STROKE TEST (V88) WAVEFORM GENERATION
R1040           NP0-, NP1-, NY0-, AND NY1NODE FOR GEN3DAP (LEM-OFF) FILTERS
R1041           PCOPY, YCOPY FOR COPY-CYCLES (USED ALSO BY TVC RESTART PACKAGE)
R1042           DAPINIT FOR INITIAL CDUS FOR RATE MEASUREMENTS
R1043           ERRORLIM, ACTLIM FOR INPUT (ATTITUDE-ERROR INTEGRATION) AND
R1044                OUTPUT (ACTUATOR COMMAND) LIMITING, COMMON TO PITCH AND
R1045                YAW DAPS
R1046           OPTVARK, NSUM, DSUM FOR CSM/LEM FILTER OPERATIONS, COMMON TO
R1047                PITCH AND YAW DAPS
R1048           RESUME

R1049   OTHER INTERFACES....

R1050       S40.8 CROSS-PRODUCT STEERING FOR BODY AXIS RATE COMMANDS OMEGAY,ZC
R1051       S40.15 FOR THE INITIAL DAP GAINS KP/KPDN (LEM-ON) OR KPGEN3 (-OFF)
R1052       TVCEXECUTIVE FOR VARIABLE DAP GAINS, FILTER SAMPLE-RATE CHANGE AND
R1053           GAIN REDUCTION AT LEM-ON SWITCHOVER, SINGLE-SHOT CG. ESTIMATION
R1054           AT SWITCHOVER AND REPETITIVE CG ESTIMATION AFTER SWITCHOVER.
R1055       TVCRESTART PACKAGE FOR TVC RESTART PROTECTION.

R1056   ERASABLE INITIALIZATION REQUIRED....

R1057       29 PAD-LOAD ERASABLES ESTROKER.....EREPPRAC +1
R1058       KP/KPDN (KPGEN3) AS IN S40.15 (R03)
R1059       CONFIGURATION BITS (14, 13) OF DAPDATR1 AS IN R03
R1060       ENGINE-ON BIT (11.13) FOR RESTARTS
R1061       TVCPHASE FOR RESTARTS (SEE IGNOVER, AND TVCINIT4)
R1062       T5 BITS (15,14 OF FLAGWRD6) FOR RESTARTS
R1063       MISCELLANEOUS VARIABLES SET UP OR COMPUTED BY TVCDAPON....TVCINIT4,
R1064            INCLUDING THE ZEROING OF 64 TEMPORARIES BY MRCLEAN
R1065       CDUX,Y,Z AND SINCDUX.... COSCDUX AS PREPARED BY CDUTRIG1 (WITH
R1066           UPDATES EVERY 1/2 SECOND)
R1067       ALSO G+N PRIMARY, TVC ENABLE, AND OPTICS ERROR COUNTER ENABLE
R1068           UNLESS BENCH-TESTING.

R1069   OUTPUT....

R1070       TVCPITCH AND TVCYAW WITH COUNTER RELEASE (11.14 AND 11.13 INCREMEN-
R1071           TAL COMMANDS TO OPTICS ERROR COUNTERS), FILTER NODES, BODY-
R1072           AXIS ATTITUDE ERROR INTEGRATOR, TOTAL ACTUATOR COMMANDS,
R1073           OPPSET-TRACKER-FILTER OUTPUTS, ETC.
R1074   DEBRIS....

R1075       MUCH, SHAREABLE WITH RCS/ENTRY, IN EBANK6 ONLY
 1076                       17,2213                 BANK   17
 1077   REF  1              20,2000                 SETLOC DAPS2
 1078                       20,2327                 BANK
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1079    REF  10  LAST  913   E6,1742          EBANK= BZERO
1080    REF  1                                COUNT* $$/DAPS
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P1081   PITCH TVCDAP STARTS HERE....(INCORPORATES CSM/LEM DAP FILTER, MODOR DESIGN)
 1083   REF  12  LAST  918   20,2327  22 016 0  PITCHDAP LXCH   BANKRUPT      TS ENTRY, NORMAL OR VIA DAPINIT
 1084                        20,2330  0 0006 1           EXTEND
 1085   REF  11  LAST  916   20,2331  22 012 1           QXCH   QRUPT
 1086   REF   1              20,2332  3 3420 1           CAF    YAWTS        SET UP TS CALL FOR YAW AUTOPILOT (LOW-
 1087   REF  16  LAST  918   20,2333  55=312 1           TS     TSLOC             ORDER PART OF 2CADR ALREADY THERE)
 1088   REF   6  LAST  907   20,2334  31=635 0           CAE    TSTVCDT
 1089   REF  12  LAST  918   20,2335  54 030 0           TS     TIMES

 1090   REF   7  LAST  919   20,2336  11=614 1  PSTROKER CCS    STROKER      (STRKFLG) CHECK FOR STROKE TEST
 1091   REF   1              20,2337  0 3506 1           TC     HACK         TEST-START OR TEST-IN-PROGRESS
 1092                        20,2340  1 2342 1           TCF    +2           NO-TEST
 1093   REF   2  LAST  924   20,2341  0 3506 1           TC     HACK         TEST-IN-PROGRESS

 1094   REF   9  LAST  736   20,2342  30 033 1  PCDUDOTS CAE    CDUY         COMPUTE CDUYDOT
 1095   REF   2  LAST  103   20,2343  57=655 0           XCH    PCDUYPST          FOR PITCH AUTOPILOT
 1096                        20,2344  0 0006 1           EXTEND
 1097   REF   3  LAST  924   20,2345  21=655 1           MSU    PCDUYPST
10971   REF   1              20,2346  0 2547 0           TCR    RLIMTEST          RATE TEST
 1098   REF   2  LAST  103   20,2347  55=657 0           TS     MCDUYDOT          (MINUS, SC.AT 1/2TVCDT REVS/SEC)

 1099   REF  12  LAST  736   20,2350  30 034 0           CAE    CDUZ         COMPUTE CDUZDOT
 1100   REF   2  LAST  103   20,2351  57=656 0           XCH    PCDUZPST          FOR PITCH AUTOPILOT
 1101                        20,2352  0 0006 1           EXTEND
 1102   REF   3  LAST  924   20,2353  21=656 1           MSU    PCDUZPST
11021   REF   2  LAST  924   20,2354  0 2547 0           TCR    RLIMTEST          RATE TEST
 1103   REF   2  LAST  103   20,2355  55=660 1           TS     MCDUZDOT          (MINUS, SC.AT 1/2TVCDT REVS/SEC)

 1104                        20,2356  0 0006 1  PINTEGRL EXTEND               COMPUTE INTEGRAL OF BODY-AXIS PITCH-RATE
 1105   REF   2  LAST  102   20,2357  3 1616 1           DCA    PERRB             ERROR, SC.AT B-1 REVS
 1106   REF   6  LAST  104   20,2360  53=743 1           DXCH   ERRBTMP

 1107                        20,2361  0 0006 1           EXTEND
 1108   REF   2  LAST  899   20,2362  3 1530 0           DCA    OMEGAYC
 1109   REF   7  LAST  924   20,2363  21=743 1           DAS    ERRBTMP

 1110   REF   5  LAST  716   20,2364  4 0746 0           CS     COSCDUZ      PREPARE BODY-AXIS PITCH RATE, OMEGAYB
 1111                        20,2365  0 0006 1           EXTEND
 1112   REF   5  LAST  718   20,2366  7 0750 1           MP     COSCDUX
 1113                        20,2367  20 001 1           DDOUBL
 1114                        20,2370  0 0006 1           EXTEND
 1115   REF   3  LAST  924   20,2371  7 1657 0           MP     MCDUYDOT
 1116                        20,2372  20 001 1           DDOUBL
 1117   REF   1              20,2373  53=536 1           DXCH   OMEGAYB

 1118   REF   3  LAST  924   20,2374  4 1660 1           CS     MCDUZDOT
 1119                        20,2375  0 0006 1           EXTEND
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1120  REF  5  LAST  718   20,2376  7 0742 1          MP     SINCDUX
1121                      20,2377  20 001 1          DDOUBL
1122  REF  2  LAST  924   20,2400  21'536 1          DAS    OMEGAYB      (COMPLETED OMEGAYB, SC.AT 1/2TVCDT REVS)

1123                      20,2401  0 0006 1          EXTEND               PICK UP -OMEGAYB (SIGN CHNG, INTEGRATE)
1124  REF  3  LAST  925   20,2402  4 1536 1          DCS    OMEGAYB
1125  REF  8  LAST  924   20,2403  21'743 1          DAS    ERRBTMP

1126  REF  1               20,2404  0 3126 1  PERORLIM TCR    ERRORLIM     PITCH BODY-AXIS-ERROR  INPUT LIMITER

1127  REF  68 LAST  914   20,2405  31'488 1  P1FILJMP CAE    DAPDATR1     CHECK FOR LEM-ON/-OFF
1128  REF  46 LAST  914   20,2406  7 4675 0          MASK   BIT14        (BIT 14 INDICATES LEM IS ON)
1129  REF 201 LAST  919   20,2407  10 000 0          CCS    A
1130                      20,2410  1 2413 1          TCF    +3           USE LEM-ON FILTER
1131  REF  50 LAST  919   20,2411  0 4574 0          TC     POSTJUMP     USE LEM-OFF (GEN3DAP) FILTER
1132  REF  1               20,2412  38213 1           CADR   NPONODE

1133                      20,2413  0 0006 1  PFORWARD EXTEND              LEM-ON FILTER COMPUTATIONS.
1134  REF  3  LAST  104   20,2414  4 1544 1          DCS    PDSUM        DENOMINATOR TERMS, SC.AT B+0 SPASCREVS
1135  REF  1               20,2415  53'745 1          DXCH   JZERO

1136  REF  9  LAST  925   20,2416  31'742 1          CAE    ERRBTMP      INPUT ERROR,  SC.AT B-1 REVS
1137  REF  3  LAST  104   20,2417  6 1541 0          AD     PNSUM        NUMERATOR TERMS, SC.AT B-1 REVS
1138                      20,2420  0 0006 1          EXTEND
1139  REF  1               20,2421  7 4727 0          MP     KPDN         KPDN, SC.AT B+1 SPASCREV
1140  REF  2  LAST  925   20,2422  21'745 1          DAS    JZERO
1141  REF  4  LAST  925   20,2423  31'542 0          CAE    PNSUM +1
1142                      20,2424  0 0006 1          EXTEND
1143  REF  2  LAST  925   20,2425  7 4727 0          MP     KPDN
1144  REF  3  LAST  925   20,2426  27'745 1          ADS    JZERO +1
1145  REF  81 LAST  901   20,2427  54 001 1          TS     L
1146                      20,2430  1 2432 1          TCF    +2
1147  REF  4  LAST  925   20,2431  27'744 0          ADS    JZERO        (SC.AT B+0 SPASCREV), (JZERO = CMDTMP)

1148                      20,2432  0 0008 1  JZSTORE EXTEND               PREPARE JZERO FOR DENOMINATOR LADDER
1149  REF  5  LAST  925   20,2433  3 1745 0          DCA    JZERO             SC.AT B+0 SPASCREV
1150                      20,2434  20 001 1          DDOUBL
1151                      20,2435  20 001 1          DDOUBL
1152                      20,2436  20 001 1          DDOUBL
1153  REF  3  LAST  105   20,2437  53'727 0          DXCH   J1TMP             SC.AT B-3 SPASCREV

1154  REF  1               20,2440  0 3141 0  OPTVARKP TCR    OPTVARK      PITCH VARIABLE-GAIN PACKAGE

1155                      20,2441  0 0008 1  POFFSET EXTEND               SIGN CHANGE IN FORWARD LOOP
1156  REF  6  LAST  105   20,2442  4 1745 1          DCS    CMDTMP            (GEN3DAP RETURNS AT POFFSET)
1157  REF  7  LAST  925   20,2443  53'745 1          DXCH   CMDTMP
1158                      20,2444  0 0008 1          EXTEND               ADD IN DOUBLE-PRECISION CG OFFSETS
1159  REF  5  LAST  908   20,2445  3 1826 1          DCA    PDELOFF
1180  REF  8  LAST  925   20,2448  21'745 1          DAS    CMDTMP
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1161  REF   9  LAST  925   20,2447  31=745 0  PROUND   CAE    CMDTMP +1     ROUND UP FOR OUTPUT
1162                       20,2450  6 0000 1           DOUBLE
1163  REF  82  LAST  925   20,2451  54 001 1           TS     L
1164  REF 162  LAST  919   20,2452  3 4714 1           CAF    ZERO
1165  REF  10  LAST  926   20,2453  6 1744 1           AD     CMDTMP

1166  REF   1              20,2454  0 3161 1  PACLIM   TCR    ACTLIM        PITCH ACTUATOR-COMMAND-LIMITER

1167  REF   7  LAST  919   20,2455  4 1631 0  POUT     CS     PCMD          INCREMENTAL PITCH COMMAND
1168  REF  11  LAST  926   20,2456  6 1744 1           AD     CMDTMP
1169  REF   4  LAST  919   20,2457  26 054 1           ADS    TVCPITCH      UPDATE THE ERROR COUNTER (NO RESTART-
A1170                                                                          PROTECT, SINCE ERROR CNTR ZEROED)

1171  REF  25  LAST  918   20,2460  3 4700 1           CAF    BIT11         BIT FOR TVCPITCH COUNT RELEASE
1172                       20,2461  0 0006 1           EXTEND
1173  REF   8  LAST  919   20,2462  05 014 1           WOR    CHAN14
1174  REF  67  LAST  925   20,2463  31=466 1  P2FILJMP CAE    DAPDATR1      CHECK FOR LEM-ON/-OFF
1175  REF  47  LAST  925   20,2464  7 4675 0           MASK   BIT14         (BIT 14 INDICATES LEM IS ON)
1176  REF 202  LAST  925   20,2465  10 000 0           CCS    A
1177                       20,2466  1 2471 0           TCF    +3            USE LEM-ON FILTER
1178  REF  51  LAST  925   20,2467  0 4574 0           TC     POSTJUMP      USE LEM-OFF (GEN3DAP) FILTER
1179  REF   1              20,2470  36246 1            CADR   NP1NODE
1180  REF  10  LAST  925   20,2471  31=742 1  BZSTORE  CAE    ERRBTMP       PREPARE BZERO (UPPER WORD OF ERRBTMP)
1181                       20,2472  6 0000 1           DOUBLE                   FOR NUMERATOR LADDER....SC.AT B-1
1182  REF   3  LAST  105   20,2473  55=717 0           TS     B1TMP                 SC.AT B-2 REVS FOR LADDER
1183                       20,2474  0 0006 1  PNLADDER EXTEND                PREPARE TEMPORARIES, FOR UPDATING PITCH
1184  REF   2  LAST  101   20,2475  3 1546 1           DCA    B1                    NUMERATOR LADDER
1185  REF   3  LAST  105   20,2476  53=721 0           DXCH   B2TMP
1186                       20,2477  0 0006 1           EXTEND
1187  REF   2  LAST  102   20,2500  3 1550 0           DCA    B3
1188  REF   3  LAST  105   20,2501  53=723 1           DXCH   B4TMP
1189                       20,2502  0 0006 1           EXTEND
1190  REF   2  LAST  102   20,2503  3 1552 1           DCA    B5
1191  REF   3  LAST  105   20,2504  53=725 1           DXCH   B6TMP

1192  REF   1              20,2505  0 3173 1  PNSUMC   TCR    NSUM          PITCH NUMERATOR SUM
1193                       20,2506  0 0006 1  PDLADDER EXTEND                PREPARE TEMPORARIES, FOR UPDATING PITCH
1194  REF   2  LAST  102   20,2507  3 1554 1           DCA    J1                    DENOMINATOR LADDER
1195  REF   3  LAST  105   20,2510  53=731 1           DXCH   J2TMP
1196                       20,2511  0 0006 1           EXTEND
1197  REF   2  LAST  102   20,2512  3 1556 0           DCA    J2
1198  REF   3  LAST  105   20,2513  53=733 0           DXCH   J3TMP
1199                       20,2514  0 0006 1           EXTEND
1200  REF   2  LAST  102   20,2515  3 1560 0           DCA    J3
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1201  REF   3  LAST  105   20,2516  53#735 0          DXCH  J4TMP
1202                       20,2517  0 0008 1          EXTEND
1203  REF   3  LAST  104   20,2520  3 1562 1          DCA   J4
1204  REF   4  LAST  105   20,2521  53#737 1          DXCH  J5TMP
1205                       20,2522  0 0008 1          EXTEND
1206  REF   3  LAST  104   20,2523  3 1564 1          DCA   J5
1207  REF   3  LAST  105   20,2524  53#741 0          DXCH  J6TMP

1208  REF   1             20,2525  0 3233 0 PDSUMC   TCR   DSUM          PITCH DENOMINATOR SUM

1209  REF  12  LAST  928   20,2528  31#744 1 DELBARP  CAE   CMDTMP        UPDATE PITCH OFFSET-TRACKER-FILTER
1210                       20,2527  0 0006 1          EXTEND                (GEN3DAP RETURNS AT  ..DELBARP..  )
1211  REF   1             20,2530  7 3421 1          MP    1-E(-AT)
1212  REF   2  LAST  104   20,2531  53#718 1          DXCH  DELBRTMP
1213  REF   5  LAST  907   20,2532  31#621 0          CAE   DELPBAR
1214                       20,2533  0 0006 1          EXTEND
1215  REF   1             20,2534  7 3422 1          MP    E(-AT)
1216  REF   3  LAST  927   20,2535  21#718 1          DAS   DELBRTMP
1217  REF   6  LAST  927   20,2538  31#822 0          CAE   DELPBAR +1
1218                       20,2537  0 0008 1          EXTEND
1219  REF   2  LAST  927   20,2540  7 3422 1          MP    E(-AT)
1220  REF   4  LAST  927   20,2541  27#716 1          ADS   DELBRTMP +1
1221  REF  83  LAST  928   20,2542  54 001 1          TS    L
1222                       20,2543  1 2545 0          TCF   +2
1223  REF   5  LAST  927   20,2544  27#715 1          ADS   DELBRTMP

1224  REF   2  LAST  920   20,2545  0 2560 0 PCOPYCYC TCR   PCOPY         PITCH COPYCYCLE

1225  REF  31  LAST  918   20,2546  1 5222 1 PDAPEND  TCF   RESUME        PITCH DAP COMPLETED
12251 REF  13  LAST  927   20,2547  55#744 0 RLIMTEST TS    CMDTMP        TEST FOR EXCESSIVE CDU RATES
12261                      20,2550  0 0006 1          EXTEND                IF CDU DIFFERENCE EXCEEDS 2.33 DEG
12271 REF   1             20,2551  7 3415 0          MP    1/RTLIM         IN ONE SAMPLE PERIOD, SET CDURATE=0
12281                      20,2552  0 0008 1          EXTEND
12291                      20,2553  1 2558 1          BZF   +3
12301 REF 183  LAST  926   20,2554  3 4714 1          CAF   ZERO
12311 REF  14  LAST  927   20,2555  55#744 0          TS    CMDTMP
12321 REF  15  LAST  927   20,2556  31#744 1          CAE   CMDTMP
12331 REF 180  LAST  914   20,2557  0 0002 0          TC    Q
```

P12341 PITCH TVCDAP COPYCYCLE SUBROUTINE (CALLED VIA PITCH TVCDAP OR TVC RESTART PACKAGE)

```
 12361 REF  8 LAST  919  20,2560  25,654 1 PCOPY    INCR   TVCPHASE      RESTART-PROTECT THE COPYCYCLE.
A12371                                                                       NOTE POSSIBLE RE-ENTRY FROM RESTART
A12381                                                                       PACKAGE, SHOULD A RESTART OCCUR
A12391                                                                       DURING PITCH COPYCYCLE.

 12401                      20,2561  0 0006 1 NEWB(S)  EXTEND
 12411 REF  4 LAST  926     20,2562  3 1720 0          DCA    B1TMP        UPDATE PITCH NUMERATOR LADDER FROM
 12421 REF  3 LAST  928     20,2583  53,548 0          DXCH   B1             TEMPORARIES
 12431                      20,2584  0 0008 1          EXTEND
 12441 REF  3 LAST  105     20,2585  3 1722 1          DCA    B3TMP
 12451 REF  3 LAST  926     20,2588  53,550 1          DXCH   B3
 12481                      20,2587  0 0008 1          EXTEND
 12471 REF  3 LAST  105     20,2570  3 1724 1          DCA    B5TMP
 12481 REF  3 LAST  928     20,2571  53,552 0          DXCH   B5

 12491                      20,2572  0 0008 1 NEWJ(S)  EXTEND               UPDATE PITCH DENOMINATOR LADDER FROM
 12501 REF  4 LAST  925     20,2573  3 1727 1          DCA    J1TMP          TEMPORARIES
 12511 REF  3 LAST  928     20,2574  53,554 0          DXCH   J1
 12521                      20,2575  0 0008 1          EXTEND
 12531 REF  4 LAST  926     20,2578  3 1731 0          DCA    J2TMP
 12541 REF  3 LAST  928     20,2577  53,556 1          DXCH   J2
 12551                      20,2800  0 0006 1          EXTEND
 12581 REF  4 LAST  926     20,2601  3 1733 1          DCA    J3TMP
 12571 REF  3 LAST  928     20,2602  53,560 1          DXCH   J3
 12581                      20,2803  0 0008 1          EXTEND
 12591 REF  4 LAST  927     20,2804  3 1735 1          DCA    J4TMP
 12801 REF  4 LAST  927     20,2605  53,582 0          DXCH   J4
 12811                      20,2808  0 0006 1          EXTEND                 (ALSO NP1TMP,+1 TO NP1,+1)
 12621 REF  5 LAST  927     20,2607  3 1737 0          DCA    J5TMP
 12631 REF  4 LAST  927     20,2610  53,564 0          DXCH   J5

 12641                      20,2811  0 0006 1 PMISC    EXTEND               MISC....PITCH-RATE-ERROR INTEGRATOR
 12851 REF 11 LAST  928     20,2612  3 1743 0          DCA    ERRBTMP
 12661 REF  3 LAST  540     20,2813  55,477 0          TS     AK1             FOR PITCH NEEDLES, SC.AT B-1 REVS
 12871 REF  3 LAST  924     20,2614  53,616 0          DXCH   PERRB

 12681                      20,2615  0 0008 1          EXTEND                 PITCH NUMERATOR SUM
 12691 REF  4 LAST  104     20,2618  3 1712 1          DCA    NSUMTMP           (ALSO NP2TMP,+1 TO NP2,+1)
 12701 REF  5 LAST  925     20,2817  53,542 1          DXCH   PNSUM

 12711                      20,2620  0 0006 1          EXTEND                 PITCH DENOMINATOR SUM
 12721 REF  4 LAST  104     20,2621  3 1714 1          DCA    DSUMTMP           (ALSO NP3TMP,+1 TO NP3,+1)
 1273I REF  4 LAST  925     20,2822  53,544 1          DXCH   PDSUM

 12741 REF 18 LAST  927     20,2823  31,744 1          CAE    CMDTMP          PITCH ACTUATOR COMMAND
 12751 REF  8 LAST  926     20,2624  55,831 0          TS     PCMD

 12781                      20,2825  0 0006 1          EXTEND                 PITCH OFFSET-TRACKER-FILTER
```

```
12771  REF   6  LAST  927   20,2626  3 1716 0        DCA     DELBRTMP
12781  REF   7  LAST  927   20,2627  53-622 1        DXCH    DELPBAR

12791  REF   9  LAST  928   20,2630  25-654 1        INCR    TVCPHASE        PITCH COPYCYCLE COMPLETED

12801  REF 161  LAST  927   20,2631  0 0002 0        TC      Q
```

```
P12811  YAW   TVCDAP STARTS HERE....(INCORPORATES CSM/LEM DAP FILTER, MODOR DESIGN)
 12631  REF  13  LAST  924   20,2632  22 016 0  YAWDAP   LXCH    BANKRUPT     T5 ENTRY, NORMAL
 12641                       20,2633  0 0006 1           EXTEND
 12651  REF  12  LAST  924   20,2634  22 012 1           QXCH    QRUPT

 12661  REF   1               20,2635  3 3416 1           CAF     PITCHT5      SET UP T5 CALL FOR PITCH AUTOPILOT (LOW-
 12671  REF  17  LAST  924   20,2636  55∝312 1           TS      T5LOC             ORDER PART OF 2CADR ALREADY THERE)
 12861  REF   7  LAST  924   20,2637  31∝635 0           CAE     T5TVCDT
 12691  REF  13  LAST  924   20,2640  54 030 0           TS      TIME5

 12901  REF   6  LAST  924   20,2641  11∝614 1  YSTROKER CCS     STROKER      (STRKFLG) CHECK FOR STROKE TEST
 12911  REF   3  LAST  924   20,2642  0 3506 1           TC      HACK         TEST-START OR TEST-IN-PROGRESS
 12921                       20,2643  1 2645 0           TCF     +2           NO-TEST
 12931  REF   4  LAST  930   20,2644  0 3506 1           TC      HACK         TEST-IN-PROGRESS

A12941                                                                       USE BODY RATES FROM PITCHDAP (PCDUDOTS)

 12951                       20,2645  0 0006 1  YINTEGRL EXTEND               COMPUTE INTEGRAL OF BODY-AXIS YAW-RATE
 12961  REF   2  LAST  102   20,2646  3 1620 1           DCA     YERRB             ERROR, SC.AT B-1 REVS
 12971  REF  12  LAST  926   20,2647  53∝743 1           DXCH    ERRBTMP

 12981                       20,2650  0 0006 1           EXTEND
 12991  REF   1               20,2651  3 1532 1           DCA     OMEGAZC
 13001  REF  13  LAST  930   20,2652  21∝743 1           DAS     ERRBTMP

 13011  REF   6  LAST  924   20,2653  30 746 1           CAE     COSCDUZ      PREPARE BODY-AXIS YAW-RATE, OMEGAZB
 13021                       20,2654  0 0006 1           EXTEND
 13031  REF   6  LAST  925   20,2655  7 0742 1           MP      SINCDUX
 13041                       20,2656  20 001 1           DDOUBL
 13051                       20,2657  0 0006 1           EXTEND
 13061  REF   4  LAST  924   20,2660  7 1657 0           MP      MCDUYDOT
 13071                       20,2661  20 001 1           DDOUBL
 13061  REF   1               20,2662  53∝540 0           DXCH    OMEGAZB

 13091  REF   4  LAST  924   20,2663  4 1660 1           CS      MCDUZDOT
 13101                       20,2664  0 0006 1           EXTEND
 13111  REF   6  LAST  924   20,2665  7 0750 1           MP      COSCDUX
 13121                       20,2666  20 001 1           DDOUBL
 13131  REF   2  LAST  930   20,2667  21∝540 0           DAS     OMEGAZB      (COMPLETED OMEGAZB, SC.AT 1/2TVCDT REVS)

 13141                       20,2670  0 0006 1           EXTEND               PICK UP -OMEGAZB (SIGN CHNG, INTEGRATE)
 13151  REF   3  LAST  930   20,2671  4 1540 0           DCS     OMEGAZB
 13161  REF  14  LAST  930   20,2672  21∝743 1           DAS     ERRBTMP

 13171  REF   2  LAST  925   20,2673  0 3126 1  YERORLIM TCR     ERRORLIM     YAW  BODY-AXIS-ERROR  INPUT LIMITER

 13181  REF  66  LAST  926   20,2674  31∝466 1  Y1FILJMP CAE     DAPDATR1     CHECK FOR LEM-ON/-OFF
 13191  REF  46  LAST  926   20,2675  7 4675 0           MASK    BIT14        (BIT 14 INDICATES LEM IS ON)
```

```
13201  REF 203  LAST  936   20,2676  10 000 0          CCS   A
13211                        20,2677  1 2702 1          TCF   +3          USE LEM-ON FILTER
13221  REF  52  LAST    3   20,2700  0 4574 0          TC    POSTJUMP    USE LEM-OFF (GEN3DAP) FILTER
13231  REF   1               20,2701   36405 0         CADR  NYONODE

13241                        20,2702  0 0006 1 YFORWARD EXTEND            LEM-ON FILTER COMPUTATIONS
13251  REF   3  LAST  104   20,2703  4 1570 0          DCS   YDSUM       DENOMINATOR TERMS, SC.AT B+0 SPASCREVS
13261  REF   1               20,2704  53#745 1          DXCH  YZERO

13271  REF  15  LAST  930   20,2705  31#742 1          CAE   ERRBTMP     INPUT ERROR,  SC.AT B-1 REVS
13281  REF   3  LAST  104   20,2706  6 1565 0          AD    YNSUM       NUMERATOR TERMS, SC.AT B-1 REVS
13291                        20,2707  0 0006 1          EXTEND
13301  REF   1               20,2710  7 4727 0          MP    KYDN        KYDN, SC.AT B+1 SPASCREV
13311  REF   2  LAST  931   20,2711  21#745 1          DAS   YZERO
13321  REF   4  LAST  931   20,2712  31#566 0          CAE   YNSUM +1
13331                        20,2713  0 0006 1          EXTEND
13341  REF   2  LAST  931   20,2714  7 4727 0          MP    KYDN
13351  REF   3  LAST  931   20,2715  27#745 1          ADS   YZERO +1
13361  REF  84  LAST  927   20,2716  54 001 1          TS    L
13371                        20,2717  1 2721 0          TCF   +2
13381  REF   4  LAST  931   20,2720  27#744 0          ADS   YZERO       (SC.AT B+0 SPASCREV), (YZERO = CMDTMP)

13391                        20,2721  0 0006 1 YZSTORE  EXTEND            PREPARE YZERO FOR DENOMINATOR LADDER
13401  REF   5  LAST  931   20,2722  3 1745 0          DCA   YZERO           SC.AT B+0 SPASCREV
13411                        20,2723  20 001 1          DDOUBL
13421                        20,2724  20 001 1          DDOUBL
13431                        20,2725  20 001 1          DDOUBL
13441  REF   1               20,2726  53#727 0          DXCH  Y1TMP           SC.AT B-3 SPASCREV

13451  REF   2  LAST  925   20,2727  0 3141 0 OPTVARKY TCR   OPTVARK      YAW  VARIABLE-GAIN PACKAGE

13461                        20,2730  0 0006 1 YOFFSET  EXTEND            SIGN CHANGE IN FORWARD LOOP
13471  REF  17  LAST  926   20,2731  4 1745 1          DCS   CMDTMP          (GEN3DAP RETURNS AT YOFFSET)
13481  REF  16  LAST  931   20,2732  53#745 1          DXCH  CMDTMP
13491                        20,2733  0 0006 1          EXTEND            ADD IN DOUBLE-PRECISION CG OFFSETS
13501  REF   5  LAST  906   20,2734  3 1630 0          DCA   YDELOFF
13511  REF  19  LAST  931   20,2735  21#745 1          DAS   CMDTMP

13521  REF  20  LAST  931   20,2736  31#745 0 YROUND   CAE   CMDTMP +1    ROUND UP FOR OUTPUT
13531                        20,2737  6 0000 1          DOUBLE
13541  REF  65  LAST  931   20,2740  54 001 1          TS    L
13551  REF 164  LAST  927   20,2741  3 4714 1          CAF   ZERO
13561  REF  21  LAST  931   20,2742  6 1744 1          AD    CMDTMP

13571  REF   2  LAST  926   20,2743  0 3161 1 YACLIM   TCR   ACTLIM      YAW  ACTUATOR-COMMAND-LIMITER

13581  REF   4  LAST  919   20,2744  4 1632 0 YCOUT    CS    YCMD        INCREMENTAL YAW  COMMAND
13591  REF  22  LAST  931   20,2745  6 1744 1          AD    CMDTMP
13601  REF   3  LAST  919   20,2746  26 053 0          ADS   TVCYAW      UPDATE THE ERROR COUNTER (NO RESTART-
A13611                                                                      PROTECT, SINCE ERROR CNTR ZEROED)
```

```
13621 REF  27 LAST  778  20,2747  3 4677 0          CAF    BIT12      BIT FOR TVCYAW COUNT RELEASE
13631                    20,2750  0 0006 1          EXTEND
13641 REF   9 LAST  926  20,2751  05 014 1          WOR    CHAN14
13651 REF  69 LAST  930  20,2752  31∝466 1 Y2FILJMP CAE    DAPDATR1   CHECK FOR LEM-ON/-OFF
13661 REF  49 LAST  930  20,2753  7 4675 0          MASK   BIT14      (BIT 14 INDICATES LEM IS ON)
13671 REF 204 LAST  931  20,2754  10 000 0          CCS    A
13681                    20,2755  1 2760 0          TCF    +3         USE LEM-ON FILTER
13691 REF  53 LAST  931  20,2756  0 4574 0          TC     POSTJUMP   USE LEM-OFF (GEN3DAP) FILTER
13701 REF   1            20,2757  36440 1           CADR   NY1NODE
13711 REF  16 LAST  931  20,2760  31∝742 1 CZSTORE  CAE    ERRBTMP    PREPARE CZERO (UPPER WORD OF ERRBTMP)
13721                    20,2761  6 0000 1          DOUBLE               FOR NUMERATOR LADDER....SC.AT B-1
13731 REF   1            20,2762  55∝717 0          TS     C1TMP       SC.AT B-2 REVS FOR LADDER
13741                    20,2763  0 0006 1 YNLADDER EXTEND             PREPARE TEMPORARIES, FOR UPDATING YAW
13751 REF   2 LAST  102  20,2764  3 1572 0          DCA    C1                NUMERATOR LADDER
13761 REF   1            20,2765  53∝721 0          DXCH   C2TMP
13771                    20,2766  0 0006 1          EXTEND
13781 REF   2 LAST  102  20,2767  3 1574 0          DCA    C3
13791 REF   1            20,2770  53∝723 1          DXCH   C4TMP
13801                    20,2771  0 0006 1          EXTEND
13811 REF   2 LAST  102  20,2772  3 1576 1          DCA    C5
13821 REF   1            20,2773  53∝725 1          DXCH   C6TMP

13831 REF   2 LAST  926  20,2774  0 3173 1 YNSUMC   TCR    NSUM       YAW   NUMERATOR SUM
13841                    20,2775  0 0006 1 YDLADDER EXTEND             PREPARE TEMPORARIES, FOR UPDATING YAW
13851 REF   2 LAST  102  20,2776  3 1600 0          DCA    Y1                DENOMINATOR LADDER
13861 REF   1            20,2777  53∝731 1          DXCH   Y2TMP
13871                    20,3000  0 0006 1          EXTEND
13881 REF   2 LAST  102  20,3001  3 1602 1          DCA    Y2
13691 REF   1            20,3002  53∝733 0          DXCH   Y3TMP
13901                    20,3003  0 0006 1          EXTEND
13911 REF   2 LAST  102  20,3004  3 1604 1          DCA    Y3
13921 REF   1            20,3005  53∝735 0          DXCH   Y4TMP
13931                    20,3006  0 0006 1          EXTEND
13941 REF   3 LAST  104  20,3007  3 1606 0          DCA    Y4
13951 REF   2 LAST  104  20,3010  53∝737 1          DXCH   Y5TMP
13961                    20,3011  0 0006 1          EXTEND
13971 REF   3 LAST  104  20,3012  3 1610 1          DCA    Y5
13981 REF   1            20,3013  53∝741 0          DXCH   Y6TMP

13991 REF   2 LAST  927  20,3014  0 3233 0 YDSUMC   TCR    DSUM       YAW   DENOMINATOR SUM

14001 REF  23 LAST  931  20,3015  31∝744 1 DELBARY  CAE    CMDTMP     UPDATE YAW  OFFSET-TRACKER-FILTER
14011                    20,3016  0 0006 1          EXTEND               (GEN3DAP RETURNS AT  ..DELBARY..  )
14021 REF   2 LAST  927  20,3017  7 3421 1          MP     1-E(-AT)
```

```
14031  REF   7  LAST  929   20,3020  53'716 1            DXCH   DELBRTMP
14041  REF   5  LAST  908   20,3021  31'623 1            CAE    DELYBAR
14051                       20,3022  0 0006 1            EXTEND
14061  REF   3  LAST  927   20,3023  7 3422 1            MP     E(-AT)
14071  REF   8  LAST  933   20,3024  21'716 1            DAS    DELBRTMP
14081  REF   6  LAST  933   20,3025  31'624 0            CAE    DELYBAR +1
14091                       20,3026  0 0006 1            EXTEND
14101  REF   4  LAST  933   20,3027  7 3422 1            MP     E(-AT)
14111  REF   9  LAST  933   20,3030  27'716 1            ADS    DELBRTMP +1
14121  REF  86  LAST  931   20,3031  54 001 1            TS     L
14131                       20,3032  1 3034 1            TCF    +2
14141  REF  10  LAST  933   20,3033  27'715 1            ADS    DELBRTMP

14151  REF   2  LAST  920   20,3034  0 3038 1  YCOPYCYC  TCR    YCOPY          YAW   COPYCYCLE

14161  REF  32  LAST  927   20,3035  1 5222 1  YDAPEND   TCF    RESUME         YAW   DAP COMPLETED
```

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P14171  YAW   TVCDAP COPYCYCLE SUBROUTINE (CALLED VIA YAW   TVCDAP OR TVC RESTART PACKAGE)

 14191  REP  10  LAST  929   20,3036  25=654 1  YCOPY    INCR    TVCPHASE      RESTART-PROTECT THE COPYCYCLE.
A14201                                                                          NOTE POSSIBLE RE-ENTRY FROM RESTART
A14211                                                                          PACKAGE, SHOULD A RESTART OCCUR
A14221                                                                          DURING YAW   COPYCYCLE.

 14231                        20,3037  0 0006 1  NEWC(S)  EXTEND                UPDATE YAW   NUMERATOR LADDER FROM
 14241  REP   2  LAST  932   20,3040  3 1720 0           DCA     C1TMP           TEMPORARIES
 14251  REP   3  LAST  932   20,3041  53=572 1           DXCH    C1
 14261                        20,3042  0 0006 1           EXTEND
 14271  REP   1               20,3043  3 1722 1           DCA     C3TMP
 14281  REP   3  LAST  932   20,3044  53=574 1           DXCH    C3
 14291                        20,3045  0 0006 1           EXTEND
 14301  REP   1               20,3046  3 1724 1           DCA     C5TMP
 14311  REP   3  LAST  932   20,3047  53=576 0           DXCH    C5

 14321                        20,3050  0 0006 1  NEWY(S)  EXTEND                UPDATE YAW   DENOMINATOR LADDER FROM
 14331  REP   2  LAST  931   20,3051  3 1727 1           DCA     Y1TMP           TEMPORARIES
 14341  REP   3  LAST  932   20,3052  53=600 1           DXCH    Y1
 14351                        20,3053  0 0006 1           EXTEND
 14361  REP   2  LAST  932   20,3054  3 1731 0           DCA     Y2TMP
 14371  REP   3  LAST  932   20,3055  53=602 0           DXCH    Y2
 14381                        20,3056  0 0006 1           EXTEND
 14391  REP   2  LAST  932   20,3057  3 1733 1           DCA     Y3TMP
 14401  REP   3  LAST  932   20,3060  53=604 0           DXCH    Y3
 14411                        20,3061  0 0006 1           EXTEND
 14421  REP   2  LAST  932   20,3062  3 1735 1           DCA     Y4TMP
 14431  REP   4  LAST  932   20,3063  53=606 1           DXCH    Y4
 14441                        20,3064  0 0006 1           EXTEND                (ALSO NY1TMP,+1 TO NY1,+1)
 14451  REP   3  LAST  932   20,3065  3 1737 0           DCA     Y5TMP
 14461  REP   4  LAST  932   20,3066  53=610 0           DXCH    Y5

 14471                        20,3067  0 0006 1  YMISC    EXTEND                MISC....YAW-RATE-ERROR INTEGRATOR
 14481  REP  17  LAST  932   20,3070  3 1743 0           DCA     ERRBTMP
 14491  REP   3  LAST  540   20,3071  55=500 1           TS      AK2             FOR YAW   NEEDLES, SC.AT B-1 REVS
 14501  REP   3  LAST  930   20,3072  53=620 0           DXCH    YERRB

 14511                        20,3073  0 0006 1           EXTEND                YAW   NUMERATOR SUM
 14521  REP   5  LAST  928   20,3074  3 1712 1           DCA     NSUMTMP             (ALSO NY2TMP,+1 TO NY2,+1)
 14531  REP   5  LAST  931   20,3075  53=566 1           DXCH    YNSUM

 14541                        20,3076  0 0006 1           EXTEND                YAW   DENOMINATOR SUM
 14551  REP   5  LAST  926   20,3077  3 1714 1           DCA     DSUMTMP             (ALSO NY3TMP,+1 TO NY3,+1)
 14561  REP   4  LAST  931   20,3100  53=570 0           DXCH    YDSUM

 14571  REP  24  LAST  932   20,3101  31=744 1           CAE     CMDTMP        YAW   ACTUATOR COMMAND
 14561  REP   5  LAST  931   20,3102  55=632 0           TS      YCMD

 14591                        20,3103  0 0006 1           EXTEND                YAW   OFFSET-TRACKER-FILTER
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14601  REF  11  LAST  933   20,3104  3 1716 0        DCA    DELBRTMP
14611  REF   7  LAST  933   20,3105  53'624 1        DXCH   DELYBAR

14621  REF 165  LAST  931   20,3106  3 4714 1        CAF    ZERO          YAW   COPYCYCLE COMPLETED
14631  REF  11  LAST  934   20,3107  55'654 0        TS     TVCPHASE            RESET TVCPHASE

14641  REF 182  LAST  929   20,3110  0 0002 0        TC     Q
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P14651  SUBROUTINES COMMON TO BOTH PITCH AND YAW DAPS....
R14661  INITIALIZATION PACKAGE FOR CDURATES....

 14671  REF  14  LAST  930   20,3111  22 018 0  DAPINIT  LXCH   BANKRUPT    T5 RUPT ENTRY (CALLED BY TVCINT4)

 14681  REF  16  LAST  906   20,3112  3 7716 0            CAF    NEGONE       SET UP
 14691  REF   6  LAST  930   20,3113  6 1835 0            AD     T5TVCDT      T5 CALL FOR PITCHDAP IN TVCDT SECS
 14701  REF   3  LAST  429   20,3114  6 4674 0            AD     NEGMAX       (T5TVCDT = POSMAX - TVCDT/2 +1)
 14711  REF   9  LAST  936   20,3115  6 1635 0            AD     T5TVCDT
 14721  REF  14  LAST  930   20,3118  54 030 0            TS     TIME5
 14731  REF   2  LAST  930   20,3117  3 3416 1            CAF    PITCHT5      (BBCON ALREADY THERE)
 14741  REF  18  LAST  930   20,3120  55«312 1            TS     T5LOC

 14751  REF  10  LAST  924   20,3121  30 033 1            CAE    CDUY         READ AND STORE CDUS FOR DIFFERENTIATOR
 14761  REF   4  LAST  924   20,3122  55«655 1            TS     PCDUYPST          PAST-VALUES
 14771  REF  13  LAST  924   20,3123  30 034 0            CAE    CDUZ
 14761  REF   4  LAST  924   20,3124  55«656 1            TS     PCDUZPST

 14791  REF   3  LAST  918   20,3125  1 5224 1            TCF    NOQRSM
R14601  BODY-AXIS-ERROR  INPUT LIMITER PACKAGE....

 14811  REF  16  LAST  934   20,3126  31«742 1  ERRORLIM  CAE    ERRBTMP      CHECK FOR INPUT-ERROR LIMIT
 14621                       20,3127  0 0006 1            EXTEND                    CHECKS UPPER WORD ONLY
 14631  REF   1              20,3130  7 4710 1            MP     1/ERRLIM
 14841                       20,3131  0 0006 1            EXTEND
 14851                       20,3132  1 3140 0            BZF    +6
 14881  REF  19  LAST  936   20,3133  11«742 0            CCS    ERRBTMP
 14871  REF   1              20,3134  3 4676 1            CAF    ERRLIM
 14861                       20,3135  1 3137 0            TCF    +2
 14891  REF   2  LAST  936   20,3138  4 4676 0            CS     ERRLIM
 14901  REF  20  LAST  936   20,3137  55«742 0            TS     ERRBTMP      LIMIT WRITES OVER UPPER WORD ONLY

 14911  REF 183  LAST  935   20,3140  0 0002 0            TC     Q
R14921  VARIABLE-GAIN PACKAGE....

 14931  REF  25  LAST  934   20,3141  31«744 1  OPTVARK   CAE    CMDTMP       VARIABLE-GAIN PACKAGE....CMDTMP CONTAINS
 14941                       20,3142  0 0006 1            EXTEND                    JZERO OR YZERO
 14951  REF   4  LAST  910   20,3143  7 1651 0            MP     VARK         VARIABLE-GAIN, SC.AT 4 ASCREV/SPASCREV
 14961  REF  28  LAST  938   20,3144  53«745 1            DXCH   CMDTMP
 14971  REF 205  LAST  932   20,3145  22 000 1            LXCH   A            LO-ORDER WORD OF INPUT CMDTMP
 14981                       20,3148  0 0006 1            EXTEND
 14991  REF   5  LAST  936   20,3147  7 1651 0            MP     VARK
 15001  REF  27  LAST  936   20,3150  27«745 1            ADS    CMDTMP +1
 15011  REF  87  LAST  933   20,3151  54 001 1            TS     L
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 15021                          20,3152  1 3154 0          TCF   +2
 15031  REP  28 LAST  936      20,3153  27'744 0          ADS   CMDTMP

 15041  REP  29 LAST  937      20,3154  53'745 1          DXCH  CMDTMP      FIX UP SCALING
 15051                          20,3155  20 001 1          DDOUBL
 15061                          20,3156  20 001 1          DDOUBL
 15071  REP  30 LAST  937      20,3157  53'745 1          DXCH  CMDTMP

 15081  REP 184 LAST  936      20,3160  0 0002 0          TC    Q
R15091  ACTUATOR-COMMAND LIMITER PACKAGE....

 15101                          20,3161  0 0006 1 ACTLIM   EXTEND            CHECK FOR ACTUATOR COMMAND LIMIT
 15111  REP   1                20,3162  7 3414 1          MP    1/ACTSAT
 15121                          20,3163  0 0006 1          EXTEND
 15131                          20,3164  1 3172 1          BZF   +6
 15141  REP  31 LAST  937      20,3165  11'744 0          CCS   CMDTMP        APPLY LIMITS
 15151  REP   1                20,3166  3 3413 1          CAF   ACTSAT
 15161                          20,3167  1 3171 1          TCF   +2
 15171  REP   2 LAST  937      20,3170  4 3413 0          CS    ACTSAT
 15181  REP  32 LAST  937      20,3171  55'744 0          TS    CMDTMP      LIMITS WRITE OVER CMDTMP

 15191  REP 185 LAST  937      20,3172  0 0002 0          TC    Q
R15201  NUMERATOR-SUM COMPUTATION....

 15211  REP   5 LAST  926      20,3173  31'717 1 NSUM     CAE   B1TMP       PREPARE NUMERATOR SUM, SCALING IS AT
 15221                          20,3174  0 0006 1          EXTEND                 B+0 REVS  ( = B+2 X B-2 )
 15231  REP   1                20,3175  7 3423 0          MP    N1
 15241  REP   6 LAST  934      20,3176  53'712 0          DXCH  NSUMTMP

 15251  REP   4 LAST  926      20,3177  31'720 0          CAE   B2TMP
 15261                          20,3200  0 0006 1          EXTEND
 15271  REP   1                20,3201  7 3424 1          MP    N2
 15281  REP   7 LAST  937      20,3202  21'712 0          DAS   NSUMTMP

 15291  REP   4 LAST  926      20,3203  31'721 1          CAE   B3TMP
 15301                          20,3204  0 0006 1          EXTEND
 15311  REP   1                20,3205  7 3425 0          MP    N3
 15321  REP   8 LAST  937      20,3206  21'712 0          DAS   NSUMTMP

 15331  REP   4 LAST  926      20,3207  31'722 1          CAE   B4TMP
 15341                          20,3210  0 0006 1          EXTEND
 15351  REP   1                20,3211  7 3426 0          MP    N4
 15361  REP   9 LAST  937      20,3212  21'712 0          DAS   NSUMTMP

 15371  REP   4 LAST  926      20,3213  31'723 0          CAE   B5TMP
 15381                          20,3214  0 0006 1          EXTEND
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 15391  REF   1                  20,3215  7 3427 1            MP     N5
 15401  REF  10  LAST  937       20,3216  21=712 0            DAS    NSUMTMP

 15411  REF   4  LAST  926       20,3217  31=724 1            CAE    B6TMP
 15421                           20,3220  0 0006 1            EXTEND
 15431  REF   1                  20,3221  7 3430 1            MP     N6
 15441  REF  11  LAST  938       20,3222  21=712 0            DAS    NSUMTMP

 15451  REF   3  LAST  105       20,3223  31=725 0            CAE    B7TMP
 15461                           20,3224  0 0006 1            EXTEND
 15471  REF   1                  20,3225  7 3431 0            MP     N7
 15481  REF  12  LAST  938       20,3226  21=712 0            DAS    NSUMTMP

 15491  REF  13  LAST  938       20,3227  53=712 0  NSUMSC     DXCH   NSUMTMP       PIX UP SCALING (NOW AT B+0 REVS)
 15501                           20,3230  20 001 1            DDOUBL
 15511  REF  14  LAST  938       20,3231  53=712 0            DXCH   NSUMTMP       SC.AT B-1 REV

 15521  REF 186  LAST  937       20,3232  0 0002 0            TC     Q
R15531  DENOMINATOR-SUM COMPUTATION....

 15541  REF   5  LAST  928       20,3233  31=726 0  DSUM      CAE    J1TMP         PREPARE DENOMINATOR SUM, SCALED
 15551                           20,3234  0 0006 1            EXTEND                    AT B+1 SPASCREVS ( = B+4 X B-3 )
 15581  REF   1                  20,3235  7 3432 0            MP     D1                 (J1TMP = J,YZERO,  SC.AT  B-3 REVS)
 15571  REF   6  LAST  934       20,3236  53=714 0            DXCH   DSUMTMP
 15581  REF   6  LAST  938       20,3237  31=726 0            CAE    J1TMP
 15591                           20,3240  0 0006 1            EXTEND
 15601  REF   2  LAST  938       20,3241  7 3433 1            MP     D1 +1
 15611  REF   7  LAST  938       20,3242  27=714 0            ADS    DSUMTMP +1
 15821  REF  88  LAST  936       20,3243  54 001 1            TS     L
 15631                           20,3244  1 3246 0            TCF    +2
 15641  REF   8  LAST  938       20,3245  27=713 1            ADS    DSUMTMP
 15651  REF   7  LAST  938       20,3246  31=727 1            CAE    J1TMP +1
 15681                           20,3247  0 0006 1            EXTEND
 15671  REF   3  LAST  938       20,3250  7 3432 0            MP     D1
 15681  REF   9  LAST  938       20,3251  27=714 0            ADS    DSUMTMP +1
 15691  REF  89  LAST  938       20,3252  54 001 1            TS     L
 15701                           20,3253  1 3255 1            TCF    +2
 15711  REF  10  LAST  938       20,3254  27=713 1            ADS    DSUMTMP

 15721  REF   5  LAST  928       20,3255  31=730 1  D2J2      CAE    J2TMP
 15731                           20,3256  0 0006 1            EXTEND
 15741  REF   1                  20,3257  7 3434 0            MP     D2
 15751  REF  11  LAST  938       20,3260  21=714 0            DAS    DSUMTMP
 15761  REF   6  LAST  938       20,3261  31=730 1            CAE    J2TMP
 15771                           20,3262  0 0006 1            EXTEND
 15781  REF   2  LAST  938       20,3263  7 3435 1            MP     D2 +1
 15791  REF  12  LAST  938       20,3264  27=714 0            ADS    DSUMTMP +1
 15801  REF  90  LAST  938       20,3265  54 001 1            TS     L
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15811                          20,3266  1 3270 0          TCF   +2
15821  REP  13  LAST  938      20,3267  27=713 1          ADS   DSUMTMP
15831  REP   7  LAST  938      20,3270  31=731 0          CAE   J2TMP +1
15841                          20,3271  0 0006 1          EXTEND
15851  REP   3  LAST  938      20,3272  7 3434 0          MP    D2
15861  REP  14  LAST  939      20,3273  27=714 0          ADS   DSUMTMP +1
15871  REP  91  LAST  938      20,3274  54 001 1          TS    L
15881                          20,3275  1 3277 1          TCF   +2
15891  REP  15  LAST  939      20,3276  27=713 1          ADS   DSUMTMP

15901  REP   5  LAST  928      20,3277  31=732 0  D3J3     CAE   J3TMP
15911                          20,3300  0 0006 1          EXTEND
15921  REP   1                 20,3301  7 3436 1          MP    D3
15931  REP  16  LAST  939      20,3302  21=714 0          DAS   DSUMTMP
15941  REP   6  LAST  939      20,3303  31=732 0          CAE   J3TMP
15951                          20,3304  0 0006 1          EXTEND
15961  REP   2  LAST  939      20,3305  7 3437 0          MP    D3 +1
15971  REP  17  LAST  939      20,3306  27=714 0          ADS   DSUMTMP +1
15981  REP  92  LAST  939      20,3307  54 001 1          TS    L
15991                          20,3310  1 3312 0          TCF   +2
16001  REP  18  LAST  939      20,3311  27=713 1          ADS   DSUMTMP
16011  REP   7  LAST  939      20,3312  31=733 1          CAE   J3TMP +1
16021                          20,3313  0 0006 1          EXTEND
16031  REP   3  LAST  939      20,3314  7 3436 1          MP    D3
16041  REP  19  LAST  939      20,3315  27=714 0          ADS   DSUMTMP +1
16051  REP  93  LAST  939      20,3316  54 001 1          TS    L
16061                          20,3317  1 3321 0          TCF   +2
16071  REP  20  LAST  939      20,3320  27=713 1          ADS   DSUMTMP

16081  REP   5  LAST  928      20,3321  31=734 0  D4J4     CAE   J4TMP
16091                          20,3322  0 0006 1          EXTEND
16101  REP   1                 20,3323  7 3440 0          MP    D4
16111  REP  21  LAST  939      20,3324  21=714 0          DAS   DSUMTMP
16121  REP   6  LAST  939      20,3325  31=734 0          CAE   J4TMP
16131                          20,3326  0 0006 1          EXTEND
16141  REP   2  LAST  939      20,3327  7 3441 1          MP    D4 +1
16151  REP  22  LAST  939      20,3330  27=714 0          ADS   DSUMTMP +1
16161  REP  94  LAST  939      20,3331  54 001 1          TS    L
16171                          20,3332  1 3334 1          TCF   +2
16181  REP  23  LAST  939      20,3333  27=713 1          ADS   DSUMTMP
16191  REP   7  LAST  939      20,3334  31=735 1          CAE   J4TMP +1
16201                          20,3335  0 0006 1          EXTEND
16211  REP   3  LAST  939      20,3336  7 3440 0          MP    D4
16221  REP  24  LAST  939      20,3337  27=714 0          ADS   DSUMTMP +1
16231  REP  95  LAST  939      20,3340  54 001 1          TS    L
16241                          20,3341  1 3343 1          TCF   +2
16251  REP  25  LAST  939      20,3342  27=713 1          ADS   DSUMTMP

16261  REP   6  LAST  928      20,3343  31=736 1  D5J5     CAE   J5TMP
16271                          20,3344  0 0006 1          EXTEND
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L TVCDAPS


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16281 REP  1                    20,3345  7 3442 1          MP     D5
16291 REP 26 LAST  939          20,3346  21=714 0          DAS    DSUMTMP
16301 REP  7 LAST  939          20,3347  31=736 1          CAE    J5TMP
16311                           20,3350  0 0006 1          EXTEND
16321 REP  2 LAST  940          20,3351  7 3443 0          MP     D5 +1
16331 REP 27 LAST  940          20,3352  27=714 0          ADS    DSUMTMP +1
16341 REP 96 LAST  939          20,3353  54 001 1          TS     L
16351                           20,3354  1 3356 0          TCF    +2
16361 REP 28 LAST  940          20,3355  27=713 1          ADS    DSUMTMP
16371 REP  8 LAST  940          20,3356  31=737 0          CAE    J5TMP +1
16361                           20,3357  0 0006 1          EXTEND
16391 REP  3 LAST  940          20,3360  7 3442 1          MP     D5
16401 REP 29 LAST  940          20,3361  27=714 0          ADS    DSUMTMP +1
16411 REP 97 LAST  940          20,3362  54 001 1          TS     L
16421                           20,3363  1 3365 0          TCF    +2
16431 REP 30 LAST  940          20,3364  27=713 1          ADS    DSUMTMP

16441 REP  4 LAST  927          20,3365  31=740 0  D6J6     CAE    J6TMP
16451                           20,3366  0 0006 1          EXTEND
16461 REP  1                    20,3367  7 3444 1          MP     D6
16471 REP 31 LAST  940          20,3370  21=714 0          DAS    DSUMTMP
16461 REP  5 LAST  940          20,3371  31=740 0          CAE    J6TMP
16491                           20,3372  0 0006 1          EXTEND
16501 REP  2 LAST  940          20,3373  7 3445 0          MP     D6 +1
16511 REP 32 LAST  940          20,3374  27=714 0          ADS    DSUMTMP +1
16521 REP 98 LAST  940          20,3375  54 001 1          TS     L
16531                           20,3376  1 3400 1          TCF    +2
16541 REP 33 LAST  940          20,3377  27=713 1          ADS    DSUMTMP
16551 REP  6 LAST  940          20,3400  31=741 1          CAE    J6TMP +1
16561                           20,3401  0 0006 1          EXTEND
16571 REP  3 LAST  940          20,3402  7 3444 1          MP     D6
16581 REP 34 LAST  940          20,3403  27=714 0          ADS    DSUMTMP +1
16591 REP 99 LAST  940          20,3404  54 001 1          TS     L
16601                           20,3405  1 3407 0          TCF    +2
16611 REP 35 LAST  940          20,3406  27=713 1          ADS    DSUMTMP

16621 REP 36 LAST  940          20,3407  53=714 0  DSUMSC   DXCH   DSUMTMP      FIX UP SCALING  (NOW AT B+1 SPASCREV)
16631                           20,3410  20 001 1          DDOUBL
16641 REP 37 LAST  940          20,3411  53=714 0          DXCH   DSUMTMP      SC.AT  B+0 SPASCREV

16651 REP 187 LAST 938          20,3412  0 0002 0          TC     Q
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P16661  CONSTANTS FOR AUTOPILOTS
R16671  NOTE....1 ASCREV (ACTUATOR CMD SCALING) = 85.41 ARCSEC/BIT  OR  1.07975111 REVS (85.41X16384/3600/360)

R16691          1 SPASCREV (SPECIAL ACTUATOR CMD SCALING) = 1.04620942 REVS

 16711                          20,3413   00375 0  ACTSAT   DEC     253             ACTUATOR LIMIT (6 DEG),  SC.AT 1ASCREV
 16721                          20,3414   00101 1  1/ACTSAT DEC     .0039525692     RECIPROCAL (1/253)

 16731  REP  36  LAST  913       4676             ERRLIM   EQUALS  BIT13           PILTER INPUT LIMIT....B-3 REVS (45DEG),
 16741  REP  27  LAST  901       4710             1/ERRLIM EQUALS  BIT3                 SC.AT B-1 REV, AND ITS RECIPROCAL

 16751                          20,3415   00115 1  1/RTLIM  DEC     0.004715        .004715(CDUDIF) =0 IF CDUDIF ± 2.33 DEG

 16761  REP   1                  4727             KPDN     =       DEC45           DESIGN-NOMINAL FILTER GAIN, SC.AT B+1
 16771  REP   3  LAST  925       4727             KYDN     =       KPDN                 SPASCREV (FOR DEC45 BITS EXACTLY)
A16761                                                                                      KPDN = .005747 DEG/DEG
A16791                                                                                      SCALED KPDN = DEC45
A16601                                                                                      1SPASCREV = KPDN(B+14)/(2X45)
A16811                                                                                                = 1.04620942 REVS
 16621  REP   1                  20,3416   02327 0  PITCHT5  GENADR  PITCHDAP       UPPER WORDS OF T5 2CADRS, LOWER WORDS
 16631  REP   2  LAST  902       20,3417   03111 0  DAPT5    GENADR  DAPINIT              (BBCON) ALREADY THERE.  ORDER IS
 16641  REP   1                  20,3420   02632 1  YAWT5    GENADR  YAWDAP              REQUIRED.
 16651                          20,3421   00243 1  1-E(-AT) OCT     00243           AT = .01SEC....EITHER(1/A=4SEC, T=40MS),
 16661                          20,3422   37535 0  E(-AT)   OCT     37535                                OR(1/A=8SEC, T=80MS)
 16671                          20,3423   50166 0  N1       DEC     -2.9708385  B-2 NUMERATOR COEFS (CSM/LEM), SC.AT B+2

 16681                          20,3424   31436 1  N2       DEC      3.1947342  B-2

 16691                          20,3425   74561 0  N3       DEC     -0.40962906 B-2

 16901                          20,3426   53277 0  N4       DEC     -2.5780275  B-2

 16911                          20,3427   27550 1  N5       DEC      2.9629319  B-2

 16921                          20,3430   63725 1  N6       DEC     -1.5101470  B-2

 16931                          20,3431   02400 1  N7       DEC      0.31243224 B-2
 16941                          20,3432   66341 1  D1       2DEC    -4.7798977  B-4 DENOMINATOR COEFS (CSM/LEM), SC.AT B+4
 16941                          20,3433   54237 0
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16951                20,3434   22707 1  D2      2DEC     9.4452763  B-4
16951                20,3435   36641 1

16961                20,3436   54220 0  D3      2DEC    -9.6593475  B-4
16961                20,3437   40714 1

16971                20,3440   13344 0  D4      2DEC     5.7231611  B-4
16971                20,3441   21146 1

16981                20,3442   74401 1  D5      2DEC    -1.7484750  B-4
16981                20,3443   61760 1

16991                20,3444   00340 0  D6      2DEC     0.21933335 B-4
16991                20,3445   23073 1
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